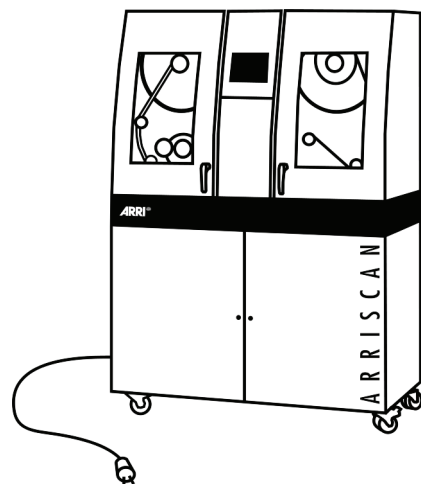

User Guide

ARRISCAN Software

Version 1.3.1

Release 04/2008



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Introduction to ARRISCAN

Welcome to the ARRISCAN film scanner! The ARRISCAN is an innovative and fast scanner for 35 mm and (optionally) 16 mm film that was designed from the ground up to deliver the best results possible. To this end, the ARRISCAN is based on a completely new concept that introduces a number of technologies that were either developed especially for the ARRISCAN, or were adapted to film scanning by ARRI. This leads to many improvements over conventional scanners:

- A full-frame CMOS sensor results in faster scanning and higher dynamic range than conventional CCD detectors. The full-frame sensor also eliminates image distortion.
- A unique microscanning system enhances the resolution of the ARRISCAN to up to 6k.
- The ARRISCAN's LED light source is the ideal light source for highfidelity film scanning. It offers unmatched stability with a virtually unlimited lifetime while not damaging the film at all. Each color channel can be individually controlled for perfect color reproduction.
- A revolutionary computer-controlled film transport mechanism provides precise pin-locked film registration as well as fast winding speeds.
- ARRI's proprietary color management technology ensures perfectly matching images even if the same film is scanned on different machines.
- The ARRISCAN software was developed especially for the requirements of the DI workflow. Its network-based architecture is ideally suited to a distributed postproduction chain. A database provides efficient management of scanning parameters. ARRI is also continuously working with suppliers of editing systems to streamline the interaction between their software and the ARRISCAN.

Since the ARRISCAN introduces a number of sophisticated new features, this manual explains the concepts behind the technology as well as the operation of the scanner. Despite the system's complexity, factory presets make it easy to get up and running quickly. At the same time the user has complete control over all details of the image acquisition process such as fine-tuning of calibration parameters and filter settings. In addition, comprehensive analysis functions are provided for assessing the image quality and the status of the scanner.

How to Read This Manual

This manual is divided into four chapters. The chapter *Understanding the ARRISCAN* (page 9) introduces the different hardware and software components of the ARRISCAN. The information in this chapter provides the background to the scanner's operation.

The chapter *Operating the ARRISCAN* (page 45) describes the operation of the scanner step by step. To get scanning quickly, you can start with this chapter and use the chapter *Understanding the ARRISCAN* (page 9) as a reference if you require more information on specific aspects of the software. In particular, the section *Basic Scanning* (page 46) is essentially a quick-start guide to operating the scanner.

The chapter *Software Reference* (page 65) gives detailed information on all parts of the software. Use this to look up things while operating the scanner or while working through other parts of the manual.

The chapter *Advanced Scanning Features* (page 159) gives additional background information about more complex scanning operations and workflows.

The chapter *astools* (page 175) describes the scripting package for manipulating the ARRISCAN's job database. These scripts can be used for automated workflow integration of the ARRISCAN.

Finally, if you come across any term that sounds unfamiliar, you can look it up in the glossary at the end of this manual. Apart from short explanations, the glossary also contains references to the corresponding parts of the manual.

Typographical Conventions

Before you start using this guide, it is important to understand the terms and typographical conventions used in the documentation.

For more information on specialized terms used in the documentation, see the glossary at the end of this document.

The following kinds of formatting in the text identify special information.

Formatting convention	Type of Information
Special Bullet (☉)	Step-by-step procedures. You can follow these instructions to complete a specific task.
Special Bold	Items you must select, such as menu options, command buttons, or items in a list.
<i>Emphasis</i>	Used to emphasize the importance of a point or for variable expressions such as parameters.
KEY+KEY	Key combinations for which the user must press and hold down one key and then press another, for example, CTRL+P, or ALT+F4.

Some features of the ARRISCAN described in this manual are available only with the Digital Dailies Base Package.

Such features are indicated with **DD only**.

Version History

Below you will find a brief history of the ARRISCAN software versions.

Version 1.3.1

- A large Output Monitor was added to view the saved images during job processing.
- Live view and Output Monitor are now OpenGL accelerated. If this causes problems, OpenGL can be disabled by setting the environment variable `ARRISCAN_GUI_NOOGL=1`.
- There is now live visual feedback on the film transport status. This feature requires PMAC 2.046 or greater.
- The Dailies tab has been added with functions for automatic punch frame location and dailies job management.
- A new resampling filter has been added for an output size of 1440 pixels across the standard aperture. This can be used to store an image in 4:3 aspect ratio inside an HD frame.

Version 1.3.0

- DICE 2.0 is now supported.
- The Digital Dailies Base Pack functionality is added including:
 - Live preview
 - Frame line detection
 - Flash detection
 - Complete Reel Scanning
 - 1.5 frames per second for 4k and 6k oversampled to 2k, pin registered
 - 5 frames per second for 2k (2048 x 1556), pin registered
 - 8 frames per second for 2k (2048 x 1556), pin registered (single exposure mode)
- Support for different lenses is added.
- Separate sliders for crisp/soft settings for each color channel are now available.
- Licensing is added.
- Support for DirectIO and parallel writing threads to mount points is provided.
- The handling of special machine calibrations has been improved. Machine calibrations with lenstype 0 now automatically use the non-adaptor version of the currently installed lens. Named calibrations are displayed using their name and only visible in service mode. Special machine calibrations 'sensorcal1' and 'sensorcal2' for automatic sensor calibrations have been added.

Version 1.2.3

- Cropping and padding of the proxy output image is now optional. In other words, by default the output image has the same size as the scaled image. This is more convenient for non-TV formats such as 1k proxies. For formats where the output image must have fixed dimensions such as TV, you can activate cropping and padding and define the output image dimensions as before.
- Support for 30 fps time code and EDLs has been added. This still assumes a one-to-one relationship between a time code frame and a film frame. It is intended for productions that shoot with 30 fps and transfer to tape without pulldown.
- Improved GUI support for calibrating the scanner geometry.

Version 1.2.2

- Fast scanning using a single exposure (instead of the standard double exposure) is now available to all current ARRISCAN customers for evaluation. Scanning with single exposure currently yields an acquisition frame rate of up to 7.2 frames per second. The trade-off is slightly more noise in the high density areas of the image.
- The ARRISCAN can now produce scaled proxies at any size up to about 1200 by 900 pixels. The rescaling algorithm supports square and rectangular pixel aspect ratios as well as letterboxing.
- The defect correction user interface has been reworked. It is now easier to create settings that can be shared by multiple output data format definitions. The user controls have also been changed to make them easier to understand. A new DPX file format was added to support PFClean for automatic correction of severe defects.
- Some GUI elements have been reduced and restructured for clarity. This rearrangement has no effect on the features of the ARRISCAN.

Version 1.2.0

- Key code based scanning is fully supported. Frame positions can be located by key code, and the in and out points of jobs can also be specified by key code. There are new options for importing key code information into the ARRISCAN's job database. This is based on lists generating the FilmScribe™ tool by Avid®.
- The handling of film calibration settings has been reworked. Film calibrations are now linked to specific film types, and can be linked to projects as well. This enables the automatic selection of film calibrations during job processing.
- Automatic defect correction based on the ARRISCAN's infrared channel is now fully integrated. Defects are seamlessly corrected using Kodak's DICE technology.
- User scripts can now be run during job procession. Scripts can be specified to execute before and after a job, as well as after each frame and when an error occurred. This can be used to automate many tasks such as file conversion, copying of files, or sending email messages.
- The ARRISCAN now supports the feet-frame format as well as the count-perf format for key code information in file metadata. Although feet-frame format is not part of the SMPTE standard for the DPX file header, most software currently cannot deal with the count-perf format.
- Since there are now more things that are determined automatically during job processing, some job log messages are now saved with the job in the job database. The Job Editor introduces new tools for displaying and managing this information.
- GUI improvements including
 - simplified marquee handling
 - improved image analysis features including a new histogram window
 - new dialogs for selecting settings.
- Support of automatic scanning of an entire reel (complete reel scanning).
- Key code logs can now be exported in ALE or FLEX format for further processing in other software. This is especially useful for scanning of complete reels.
- Custom output LUTs are now supported for Cineon and DPX formats as well.

Version 1.1.0

- The sizing and positioning of proxies has been improved. The geometry of the proxy file now matches the high resolution file to within 1 pixel.
- The sharpness of proxies has been improved to better resemble the high resolution file.
- An infrared (IR) color channel for automatic correction of image defects caused by dust and scratches is available. The correction uses Digital ICE (DICE), a technology licensed from Kodak.
- The message logging system is improved so that individual log files do not grow larger than a specified size (default: 10 MB).
- Support for the ARRISCAN SpeedPack has been added.

1 Understanding the ARRISCAN

This chapter introduces the software and hardware of the ARRISCAN. It explains the concepts behind the design of the scanner and its software architecture.

In This Chapter

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The Imaging Process	23
The ARRISCAN Workflow	40

1.1 Scanner Components

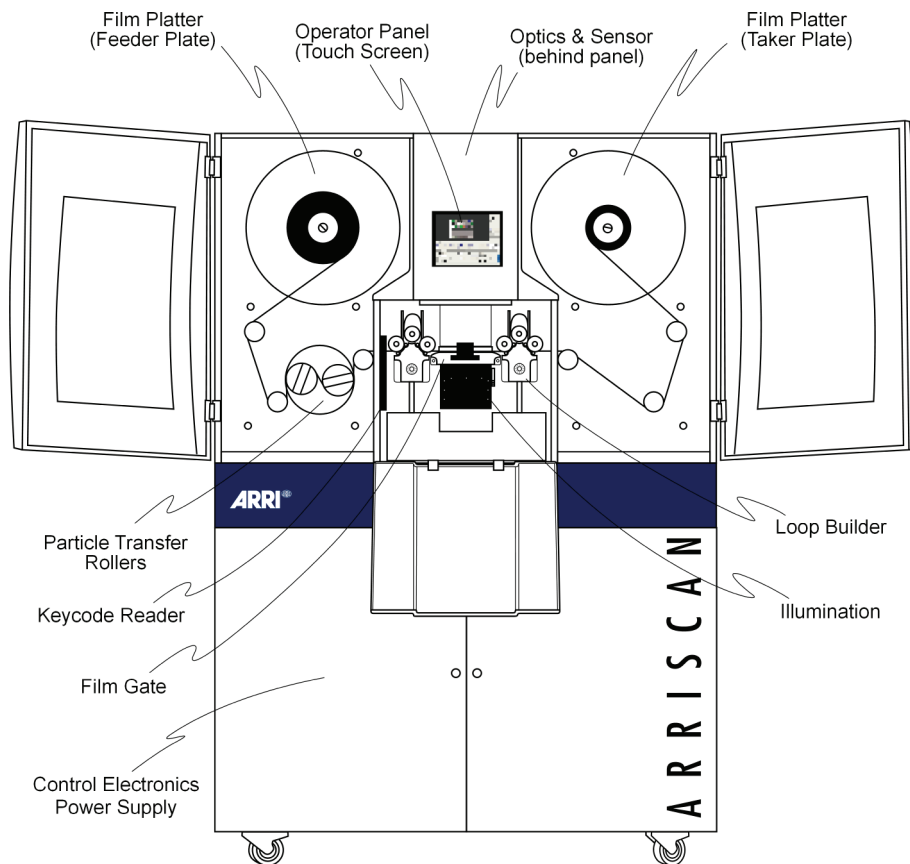


Figure 1: Schematic drawing of the ARRISCAN with open doors.

The important parts for operating the scanner are shown in the figure above. There is also a simplified drawing that highlights how the film is actually carried through the scanner and imaged in *The Optical Train* (page 23).

Film Platters

The film platters hold the film. They are mounted vertically at a slight angle for easy loading and unloading. The ARRISCAN counts positive frame increments from left to right, that is the left platter is usually the feed platter, and the right platter is the take-up platter.

Optics Platform

The optics platform is located behind the protective panel that also holds the touch screen. During scanning, the film plane is imaged onto the sensor by the optics.

Both optics and sensor are mounted on vertical actuators. The distance between optics and sensor can be adjusted to focus the image. The ARRISCAN software has an auto focus algorithm that does this automatically. Changing the distance between film and optics changes the magnification of the optical system, or the size of the area of the film that is imaged onto the sensor. The ARRISCAN software has a range of predefined magnifications for all common image formats that are used with 35 mm and 16 mm film.

Sensor

The sensor (or camera) is mounted on the optics platform. In contrast to conventional line-scan film scanners, the ARRISCAN uses a full frame sensor that has one pixel for every pixel in the output image.

- A full-frame sensor has a larger area than a line sensor and can collect more light. This reduces noise and protects the film from intense illumination.
- The ARRISCAN does not need a continuous light source. It can therefore use LEDs to illuminate the film, which has a number of advantages as described in the next section.
- Since the image is acquired while the sensor is held in a fixed position, distortion is eliminated. Using a fixed full-frame sensor together with the LED light source, a single sensor can be used to acquire the different color channels.

The sensor is based on CMOS technology, which has a number of advantages over conventional CCDs:

- CCD sensors exhibit blooming: if a pixel is overexposed, adjacent pixels also become brighter. CMOS sensors do not suffer from blooming. This means that the ARRISCAN can overexpose the sensor in order to extend its dynamic range (see *Dynamic Range* (page 24)).
- CMOS sensors support direct readout of smaller areas of the sensor. This can be used to speed up scanning if the full area of the sensor is not required (for instance, when scanning 3-perf film).

Illumination

The illumination system consists of LEDs in the three primary colors used for scanning (red, green, and blue) as well as infrared. An integrating sphere produces diffuse and homogenous illumination across the film frame. To scan a frame, a separate image is acquired for each color channel. For each image, the film is illuminated for a fraction of a second by the LEDs for one color. When the scanner is operated with an open front as shown in the figure above, the reflections of the exposure sequence are clearly visible above the film gate.

As a precaution, never look directly into the light source when the LEDs are flashing!

Since the LEDs illuminate the film only briefly, there is very little energy going through the film. The white light sources such as halogen or arc lamps that are used in conventional film scanners emit most of their energy as heat, which damages the film and does not contribute to the imaging process. In contrast to this, the ARRISCAN's LED illumination does not produce any unwanted light and does not heat up or damage the film. The light source is feedback controlled and therefore very stable. Its lifetime is essentially unlimited.

Because the exposure for each color channel can be controlled individually, the illumination can be calibrated for specific film stocks. This means that the film calibration is done in the analog domain during image acquisition, which reduces digital post processing and maximizes the dynamic range of the system.

Film Gate

The film gate registers the film and holds it in place while the image is scanned. The film is pin registered with an electrically driven element. 35 mm film is registered with two pins on either side of the frame. 16 mm film is registered with a single pin. A defined film plane is obtained by pressing the film up against the top of the gate with an electrically controlled frame. The frame retracts when the film is transported. The electronics inside the gate allow precise control over the force applied to the pin for gentle film handling and detection of misregistrations. There are different gate versions for 35 mm and 16 mm film.

Loop Builders

Each loop builder consists of a large pusher roll and four smaller pressure rollers. When no film is loaded, the loop builders are retracted. During the loading process the loop builders are moved upwards. The large roll pushes against the film and forms the film loops that are required when advancing the film frame-by-frame. When the loop builder is in its final position, the pressure rollers push the film against the sprockets to either side of the loop builder.

Since the ARRISCAN is a full-frame scanner, the film is stationary while it is scanned. To advance to the next frame, the sprockets pull the film very quickly through the gate with the film loops taking up the slack. The film transport controller then balances the loops again by rotating the film platters, which is a much slower process due to the large inertia of the heavy film rolls.

There are different versions of loop builders for 35 mm and 16 mm film.

Key Code Reader

The key code reader detects the machine-readable key code numbers on the edge of the film. It can read on the inner and outer edge of 35 mm film, and on the perforated edge of 16 mm film. The reader is positioned before the gate in the direction of forward film movement so that a frame's code is detected before the frame reaches the gate.

Particle Transfer Rollers (PTRs)

The Particle Transfer Rollers are special rubber rings designed to remove dirt from the film. They can be rotated into and out of the film path. They can also be removed for cleaning.

Control Electronics

The control electronics and the power supply are located in the bottom part of the scanner. The electronics consist of the controllers for illumination, sensor, and film transport, as well as custom hardware for image preprocessing. The control computer is placed in a separate cabinet next to the scanner (not shown in the image above).

Operator Panel

The ARRISCAN is operated directly through its control software. The touch screen on the scanner's front panel that runs the software's user interface was designed so that all functions required for operating the scanner are easily accessible through large buttons. The user interface can also run simultaneously on a separate assistant computer with a larger screen for detailed image analysis and preparation of scanning jobs.

1.2 The Software Concept

The ARRISCAN uses a distributed software model in which components communicate over the network. This section describes the software infrastructure and the communication between users and software.

1.2.1 The Network Infrastructure

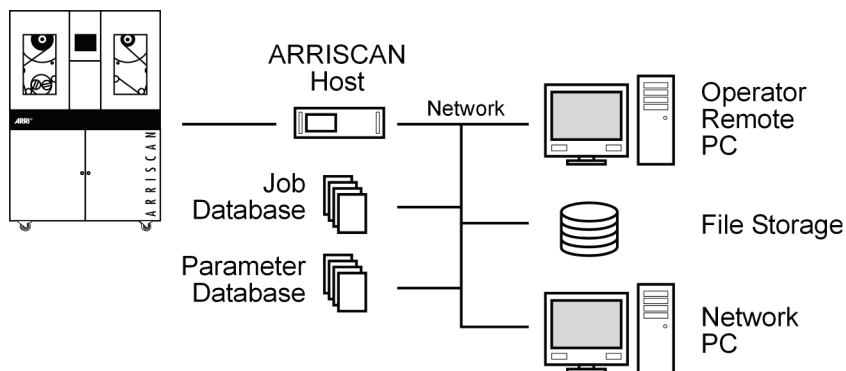


Figure 2: Network infrastructure for a single ARRISCAN installation.

The figure above shows the network infrastructure in a typical ARRISCAN installation with a single scanner. The individual components are described below.

The Host PC

The host PC communicates with the scanner's hardware and serves as the main network interface to the scanner. The touch screen on the scanner's front panel is also driven by the host. The host PC runs the Linux operating system. Remote computers can log directly into the host, or can run software components locally that connect to components on the host.

The Database

The ARRISCAN stores its setup and configuration settings in a database system. These settings include:

- The system configuration, which includes settings of image resolution and geometry, as well as processing parameters such as filter settings.
- The system calibration data.
- The film calibration data.
- Scanning jobs such as imported cut lists and EDLs.

The database can be accessed by multiple users simultaneously. For instance, scanning jobs can be set up on any computer on the network and can be loaded into the database while the scanner is processing other jobs. There is one database for scanner specific data such as calibration parameters (the Parameter Database), and one database for non-specific data such as system configuration and scanning jobs (the Job Database). This concept is explained in more detail in *Multiple ARRISCANs* (page 16).

The Operator Remote PC

The scanner installation includes a remote operator PC that usually sits next to the scanner. The touch screen on the scanner's front panel is sufficient for tasks that deal with the hardware directly (such as loading film and starting jobs). For other tasks such as setting up scanning parameters, analyzing images, and setting up jobs it is more convenient to work on the remote PC, which has a larger monitor and a keyboard.

The remote PC runs the Windows operating system. The software's user interface is brought up by logging into the host PC and opening a graphic terminal on the remote PC, so that the scanner is operated under Linux. This can be done using the same account as the touch panel on the scanner, so that the interface looks and behaves exactly the same.

File Storage

Most sites have a large file server or SAN on their network. The ARRISCAN can save scanned images directly onto such systems over the network. In turn, the remote PC can access these files just as any other machine on the network.

Alternatively, file storage can be connected directly to the host PC using interfaces such as Firewire or FibreChannel. The host can make such storage systems available to other machines through the network.

Network PCs

Any machine on the network can access the host PC and the ARRISCAN databases. There are stand-alone versions of some software modules (such as the Job Editor) that run natively on Linux or Windows, which can be installed on any network computer. This allows different users such as operators or project managers to work independently of each other.

Multiple ARRISCANs

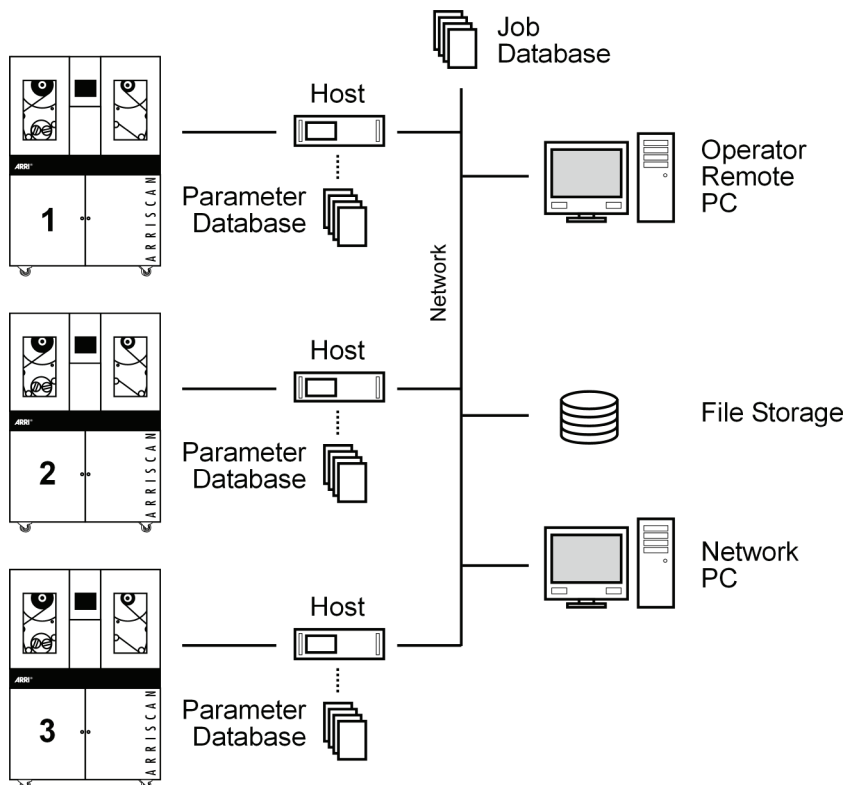


Figure 3: Network infrastructure for an installation with multiple ARRISCANs.

In an installation with more than one scanner, there is data that is different for each individual scanner, such as calibration data. On the other hand, things like image parameters and job definitions are common for all scanners. In such installations, there is a separate parameter database for each scanner for storing scanner-specific data, and a single job database that is shared by all scanners for machine-independent data. Scanner specific settings that are used in job definitions are referenced by name. A setting with the same name is then created on each individual scanner, and the parameters in the setting are adjusted so that each scanner produces calibrated output. This means that images will look the same no matter on which machine they were scanned. Therefore, multiple scanners can be used in parallel within the same project. Material from different scanners can be intercut, and rescans can be made on any machine.

1.2.2 Software Components

A large part of the ARRISCAN's functionality is implemented in software. This enables ARRI to develop new features quickly and deploy them with a simple software update. The software is based on a modular concept. As the software is developed further, new modules may appear which may be combined into different stand-alone applications.

Daemon (MeDaemonD)

The daemon is the ARRISCAN's core software module. Its executable is called `MeDaemonD`. It has exclusive access to the scanner's hardware and runs all scanning operations. The daemon has no user interface and runs in the background. It provides a network-based interface to other software modules that can access the daemon to control the scanner, start jobs, or monitor the scanner's activity. Modules that connect to the daemon may run on the same account on the host, on a different account on the host, or on a different account on another machine on the network.

There is exactly one instance of `MeDaemonD` running on the scanner's host computer. In an installation with multiple ARRISCANs, each scanner's host runs an instance of `MeDaemonD`.

GUI (Marvin)

The ARRISCAN's Graphical User Interface (GUI) is provided in a separate module. Its executable is called `Marvin`. The GUI connects to the daemon through the latter's network-based interface. Several instances of the GUI can be connected to the daemon at the same time.

Job Editor (JobEditor)

The Job Editor is a graphical user interface for setting up and editing scan jobs. Its stand-alone executable is called `JobEditor` and runs on Linux or Windows. The Job Editor is also part of the `Marvin` GUI.

The Job Editor only interacts with the job database and the parameter database, not with the daemon. Therefore, it does not affect the scanner's operation directly, and the stand-alone module does not access the daemon at all.

Film Transport

The ARRISCAN's film transport consists of separate computer-controlled motors that have no mechanical link with each other. Therefore, the characteristics of the film transport are entirely software-controlled. The motor controller is a dedicated real-time computer system that runs its own operating system and software. The controller is also called PMAC after its manufacturer's model code. All transport parameters such as film tension and loop size are continuously monitored in the background. The controller receives commands for high-level operations such as loading or unloading the film and shuttling to a specified position from the daemon. In turn, a GUI instance can issue such commands through the daemon's network interface.

Scripts

The ARRISCAN software supports scripting via standard UNIX shell scripts. Scripts are mainly used to import data from an editing system into the job database, but can also trigger other activities such as file transfer or email messaging.

The ARRISCAN software provides scripts for importing and exporting a number of standard file formats to and from the job database. These scripts can be configured and started via user friendly graphical interfaces from within the ARRISCAN's GUI modules. They can also be called directly from the command line in a shell script. The import/export scripts are part of the *astools Package* (page 175). The astools scripts are written in the Perl scripting language.

The ARRISCAN can also run arbitrary user scripts during job processing. This is described in detail in *Job Scripts* (page 166).

1.2.3 Software Options

Starting with version 1.3.0, some functionality of the ARRISCAN software is optional and must be licensed separately. This section describes the available options.

To check for your installed software version and licenses, click on the ARRI Logo in the lower-right corner of the main window to open an information box.

SpeedPack 1

The SpeedPack 1 option increases the scanning speed to

- 5 frames per second for 2k resolution
- 1.5 frames per second for 4k and 6k/2k resolution

SpeedPack 1 includes both hardware and software modifications of the scanner. For more details see *SpeedPack 1* (page 37).

ARRISCAN 4k Option

The 4k option is required to enable scanning at 4k. This options includes both hardware and software modifications of the scanner.

Digital Dailies Base Package

The Digital Dailies Base Package offers functionality required for high volume work such as dailies scanning. It comprises

- enhanced scanning speeds up to
 - 5 frames per second for 2k resolution
 - 1.5 frames per second for 4k resolution
 - 8 frames per second for 2k in single exposure mode
- automatic camera flash detection (scene detection)
- automatic frame line detection and correction (re-racking)
- a monochromatic live view during shuttling
- a jog shuttle wheel (hardware) for precise control of ARRISCAN film transport.

The Digital Dailies Base Package is only available in conjunction with the SpeedPack 1 option.

1.2.4 Control Flow

The control flow describes the interaction between software and hardware components.

Basic Control Flow

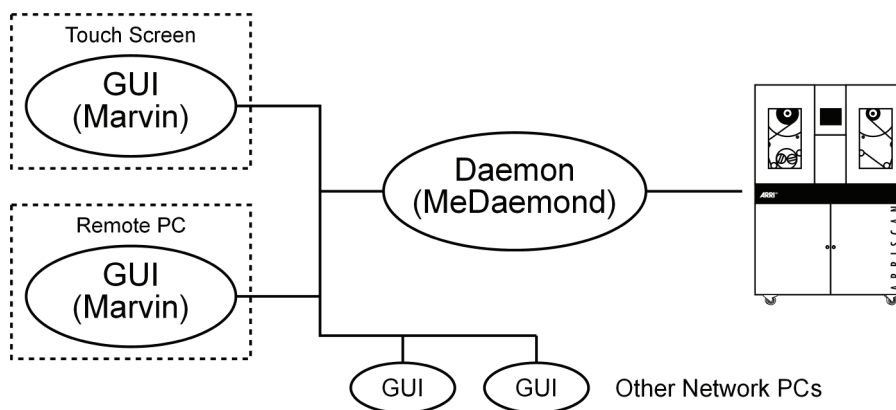


Figure 4: The ARRISCAN's basic control flow architecture.

The daemon serves as the central access point to the scanner for all other software components. Instances of user interface modules connect to the daemon through a network-based interface. In the standard installation, there are two GUIs running in parallel: one on the screen on the scanner's front panel, and another on the remote PC. It is also possible to start more instances on any network computer, although it can be dangerous to have access to the scanner's film transport from a network PC.

Detailed Control Flow

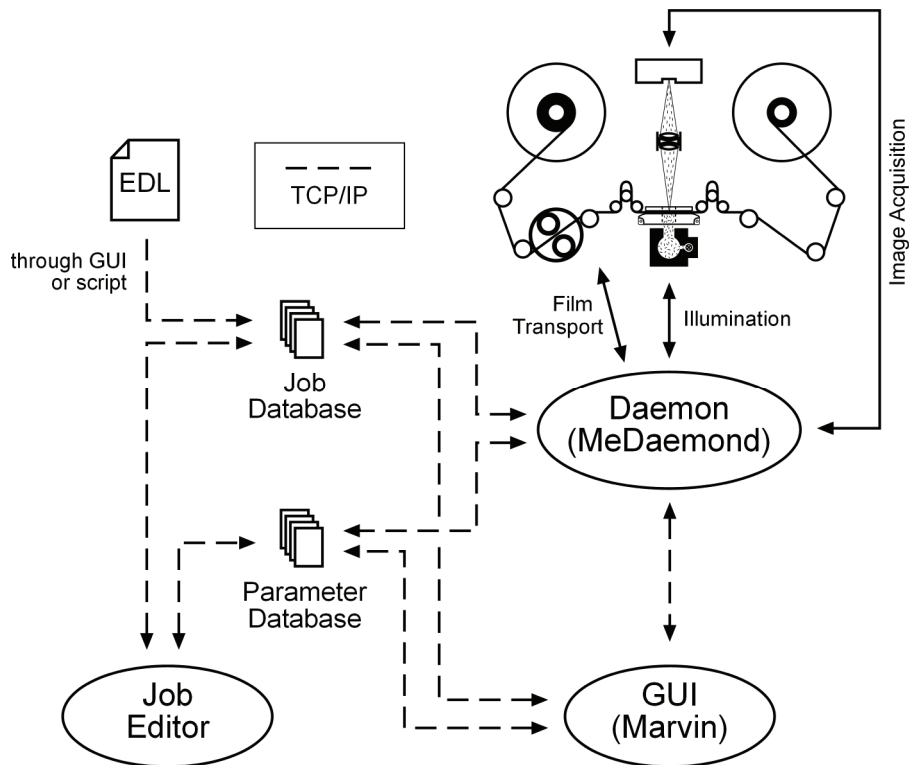


Figure 5: Detailed control flow showing the interactions of different software and hardware modules.

The figure above shows the control flow in more detail. The daemon is the only module that has access to the scanner's hardware.

- The film transport controller runs all transport related hardware components, including the motor controllers for the film platters and transport sprockets. It also controls the gate (pin registration), the PTRs, and the linear actuators for optics and sensor.
- The illumination electronics controls the intensity and flash duration of the LED illumination for each color channel.
- The image acquisition electronics is responsible for transferring the image from the sensor, preprocessing it, and passing it on to the host PC.

The GUI communicates with the daemon through an interface that is based on the TCP/IP network protocol. Both GUI and daemon have access to the job and parameter databases. They will automatically pick up any changes in the database contents.

Scan jobs can be set up from any network machine with the Job Editor. It requires access to both job database and parameter database.

EDLs that were exported by an editing system can be imported into the database by means of the EDL importer script. This script can be invoked from the Job Editor through a graphical user interface, or can be called directly from the command line in a shell window.

1.3 The Imaging Process

This section describes the ARRISCAN's imaging system. Some characteristics that are common to any digital imaging system are introduced briefly. The ARRISCAN also has a number of unique features that explained in more detail, for instance in *Microscanning* (page 26) and *Matching Film Frame to Sensor* (page 27).

1.3.1 The Optical Train

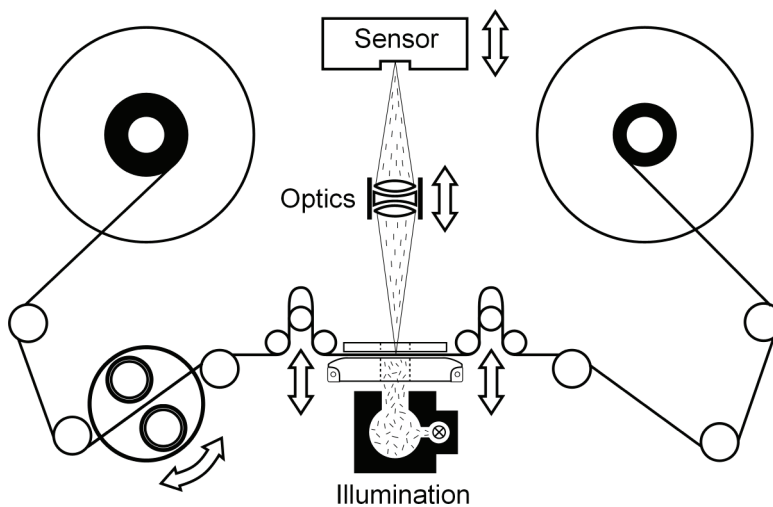


Figure 6: Schematic of the ARRISCAN's film transport and optical train.

The figure above shows how the film is imaged by the ARRISCAN. The sensor and optics are normally hidden behind the panel that holds the touch screen (see also *Scanner Components* (page 10)). Also shown in the figure is the film path, including the film loops on either side of the gate.

The illumination consists of the LED light source and the integrating sphere. The simplified drawing above shows how the sphere produces diffuse light that is channeled through the gate onto the film. The film surface is imaged onto the sensor by the optics. Both optics and sensor can be moved to achieve different magnifications of the film on the sensor (see also *Illumination* (page 11) and *Optics Platform* (page 10) above, and *Matching Film Frame to Sensor* (page 27) below).

1.3.2 Dynamic Range

A vital specification of any system that measures light is the range of light intensities it can capture. This is also called the dynamic range of the system. Problems arise if the amount of light that has to be detected is very low, because then the noise in the detection electronics becomes most apparent. In other words, if there is enough light, the system noise can be neglected.

In contrast to other film scanners, the ARRISCAN has a controllable light source that can produce plenty of light. As explained in *Sensor* (page 11), the ARRISCAN also uses a CMOS sensor that is not susceptible to blooming. This combination enables the ARRISCAN to employ a sophisticated trick to maximize its dynamic range. For every color channel in the final image, two images are acquired:

- First, the light source is set to produce a normal image that does not clip in the most transparent regions of the film.
- Then, a second image is acquired with 10 times the exposure of the normal image. In this image, the transparent (low density) regions of the image are overexposed and therefore lost. However, in the regions with low transparency (high density), the amount of collected light is 10 times higher than in the normal image, and therefore the noise is much lower.

The two images are then combined into a single image whose dynamic range is much higher than that of an image that was only exposed once. The process is similar to High Dynamic Range (HDR) images that are used to render room reflections into computer-generated 3D graphics.

The dynamic range of an image acquired with this technique on the ARRISCAN exceeds the capabilities of the standard 10-bit logarithmic file format (Cineon or DPX) that is commonly used to store motion picture film scans. While the quality of such files is still excellent, the full dynamic range of the ARRISCAN can only be preserved in a 16-bit format such as TIFF at the expense of a larger file size. As storage space becomes cheaper, such images will offer more latitude for image enhancement in digital color grading.

The double exposure technique described above is the standard method of image acquisition for the ARRISCAN, resulting in scans of unsurpassed quality. However, it is also possible to acquire images with a single exposure only. In this mode of operation, the ARRISCAN is almost twice as fast at the expense of a higher noise level in the high densities of the final image.

Single or Double Exposure? (DD only)

Why does the ARRISCAN offer both single and double exposure? Often it is desirable to be able to work faster at the expense of image quality. Of course, even in single exposure mode, the image quality of the ARRISCAN is still exceptional keeping in mind that the ARRISCAN is the only scanner on the market to offer double exposure in the first place. In single exposure mode, the ARRISCAN is also the fastest film scanner available. At more than 8 frames per second, the single exposure mode makes the ARRISCAN a feasible option for applications that up to now could only be handled by a telecine. Since the ARRISCAN is also calibrated in color and geometry, it is possible to scan a large amount of material at single exposure at a low resolution and later scan selected takes at full high resolution quality with double exposure, with scans from both passes matching each other. This for the first time opens up the possibility to have color correct images that match the geometry of the final high resolution scan throughout the postproduction workflow.

The actual difference between scans made with single and double exposure is the amount of noise in the high density parts of the image. ARRI recommends that facilities conduct their own tests to assess the image quality in both cases. Please decide for yourself in which situations single exposure images are sufficient and when double exposure is required.

1.3.3 Sensor Resolution

The resolution of the sensor is determined by its total number of pixels. This figure is often given as the horizontal number of pixels, since this number is used to denote the resolution of the scanned image. For instance, an image scanned with a resolution of 2k means that the image has 2048 pixels in the horizontal direction. The number of pixels in the vertical direction depends on the aspect ratio of the image: for example, a full-frame 4-perf image is usually scanned at 2048 by 1556 pixels, while a 3-perf image would be scanned at 2048 by 1152 pixels.

1.3.3.1 Native Resolution

The sensor of the ARRISCAN has a physical resolution of 3072 by 2160 pixels. The pixels are square and measure 8.25 μm on each side. Therefore, the size of the sensor's imaging area is about 25.34 mm by 17.82 mm, which is slightly larger than a 4-perf 35 mm film frame. The sensor is thus much larger than those used in video cameras. Apart from the large pixel size, which reduces noise because more light can be collected, the size of the sensor also makes it possible to work near the optimum 1:1 magnification ratio when scanning 35 mm film. For more details on how the film frame is imaged onto the sensor see *Matching Film Frame to Sensor* (page 27).

1.3.3.2 Microscanning

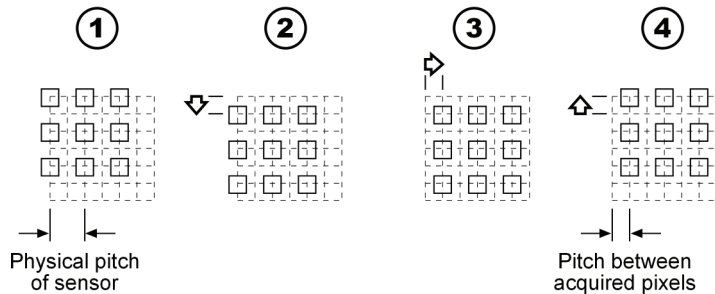


Figure 7: The microscanning principle.

The ARRISCAN's sensor is mounted on a piezoelectric actuator that can shift the sensor horizontally and vertically very quickly with an accuracy of a fraction of a pixel. The actuator allows the ARRISCAN to increase the physical resolution of the sensor. The figure above illustrates the principle: the sensor is shifted three times by half the physical pitch of the sensor. The resulting four images are combined into one image that has twice the resolution and four times the size of a single image.

With microscanning enabled, the ARRISCAN behaves as if its sensor has a resolution of 6144 by 4320 pixels. The only drawback compared to a true 6k sensor is the fact that it takes four times longer to acquire an image.

The figure shows that the effective light sensitive area of the sensor pixels is smaller than the sensor's pitch. This is an accurate representation of the sensor; however, the microscanning principle does not require this to be the case.

1.3.3.3 Oversampling

Any analog-to-digital conversion needs to deal with the problem that the resolution of the digital sensor is lower than that of the analog input medium. For instance, if you use a sensor that has n pixels per mm to scan an image, the scanner can only distinguish features up to a resolution of $0.5 * n$ lines per mm. Above that, it can't tell the difference between resolutions of multiples of n lines per mm. This is called *aliasing*. When scanning motion picture film, the effects of aliasing can make images appear grainier than they are. On hard-contrast edges, aliasing can introduce flickering. Generally, aliasing makes the film appear more 'digital'.

There are ways to reduce the effects of aliasing. The best method is to increase the resolution of the sensor and use digital filtering to calculate an image at the desired lower resolution. This is called oversampling. The native resolution of the ARRISCAN's sensor was chosen so that a 2k image (2048 pixels horizontal resolution) can be scanned with an oversampling of 4:3. The ARRISCAN uses sophisticated digital filters when oversampling is applied. These filters are tuned for speed and quality at the following oversampling ratios:

Resolution	Oversampling Ratio	Comments
3k to 2k	4:3	Fast low-alias mode
6k to 4k	4:3	High resolution low alias mode
6k to 2k	8:3	Very low alias mode
3k to 1k	8:3	For proxy calculation

Most digital intermediate productions currently use a 2k image format. The ARRISCAN's 3k to 2k oversampling mode delivers low-alias 2k images at the scanner's full speed.

The ARRISCAN can also be operated at the sensor's native resolution of 3k (or 6k with microscanning enabled). In these modes, the ARRISCAN's image filters still reduce aliasing, but not as effectively as with oversampling. It is recommended that facilities carry out their own tests to decide which operating mode suits their projects best.

1.3.4 Matching Film Frame to Sensor

There is a multitude of frame sizes used in the film industry. These include academy framing, full aperture framing, and 3-perf framing for 35 mm stock, and the smaller Super 16 mm format. This section explains how the ARRISCAN matches different frame formats to its fixed-size sensor.

1.3.4.1 Magnification

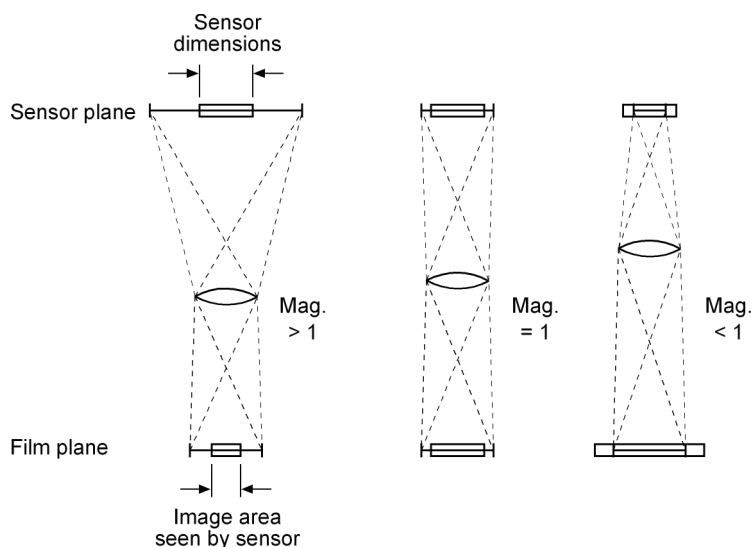


Figure 8: The effect of different magnifications on the imaged area of the film.

In order to support all required output formats for scanning 35 mm and 16 mm film, the ARRISCAN can adjust the magnification of its optical system. For example, an ARRICAM 3-perf frame measures 24.9 mm by 13.9 mm. In order to scan this framing in 2k resolution (2048 pixels horizontally) with 4:3 oversampling, the magnification must be set so that $2048 * 4 / 3 = 2730$ pixels fit across the 24.9 mm frame. To scan the same frame in HDTV format (1920 pixels horizontally), the system must fit $1920 * 4 / 3 = 2560$ pixels across the same frame. To scan a Super 16 mm frame in these formats, the same number of pixels must fit across a film frame that is only 12.35 mm wide.

The figure above shows how different magnifications affect the imaging of the film frame onto the sensor. The sensor dimensions are fixed. The optics are moved to achieve different magnifications.

- To image a small frame such as a 16 mm negative across the sensor, the magnification is set to values larger than 1. As shown in the figure, the sensor then covers a smaller area in the film plane. Conversely, the frame appears magnified in the sensor plane.
- When the magnification is set to 1, the components are symmetric, and the imaged area in the film plane has the same size as the sensor.
- At magnifications smaller than 1, the sensor images a larger area in the film plane.
- When scanning 35 mm film, the ARRISCAN operates at magnifications near 1.

1.3.4.2 Pitch

Instead of magnification, the ARRISCAN software uses the term "pitch" in analogy to the ARRILASER film recorder. The pitch specifies the distance between two adjacent pixels. Since the ARRISCAN always uses square pixels, this is the same as the width and height of a pixel.

If pitch and magnification describe the same thing, how is pitch measured in the ARRISCAN? As discussed above, the quantity of interest is the size of the frame area covered by the scanned image. In other words, the pitch is the size that a pixel in the image had on the actual film

As explained in *Native Resolution* (page 25), the pixels in the sensor are spaced at $8.25\text{ }\mu\text{m}$. Therefore, at a magnification of 1.0, each pixel would correspond to an area of $8.25\text{ }\mu\text{m}$ by $8.25\text{ }\mu\text{m}$ on the film - the pitch is $8.25\text{ }\mu\text{m}$. At a magnification of 1.09, each sensor pixel covers an area of $9.0\text{ }\mu\text{m}$ by $9.0\text{ }\mu\text{m}$ on the film, therefore the pitch is $9.0\text{ }\mu\text{m}$. In terms of the example in the previous section, a 2k image that was imaged with a pitch of $9\text{ }\mu\text{m}$ and an oversampling of 4:3 corresponds to a frame width of $(2048 * 4 / 3) * 9\text{ }\mu\text{m} = 2730 * 9\text{ }\mu\text{m} = 24570\text{ }\mu\text{m} = 24.57\text{ mm}$.

1.3.4.3 Native And Final Pitch

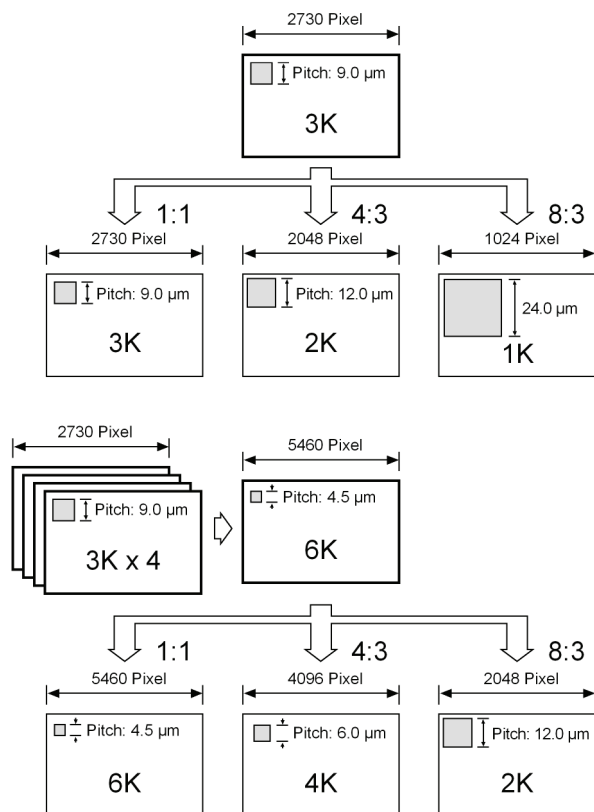


Figure 9: Diagram of the different pitches that the ARRISCAN can generate through oversampling and microscanning at a single magnification.

In combination with oversampling and microscanning, the concept of pitch becomes more complicated because the pitch of the final output image does not depend on the magnification alone. The example in the figure above shows the different types of output images that can be generated at a magnification of 1.09. As shown in the top half of the figure, without oversampling each pixel in the output image corresponds to a sensor pixel, leading to the expected pitch of 9.0 μm . However, when oversampling at 4:3, each pixel in the image corresponds to a larger area on the frame, resulting in a pitch of 12.0 μm . For the proxy image that is oversampled at 8:3, the pitch is even larger.

Microscanning essentially halves the pitch of the sensor, which is shown in the bottom half of the figure. Starting from 4 3k images, a 6k image is calculated with a pitch of 4.5 μm . Different oversampling ratios then yield output formats with pitches of 4.5 μm , 6.0 μm , and 12.0 μm , respectively.

The ARRISCAN software uses the term native pitch for a pitch value that depends only on the magnification, but ignores oversampling and microscanning. The term final pitch is used for the pitch of the output image, with magnification, oversampling, and microscanning taken into account. The distinction between native and final pitch is important for the system calibration, as explained in *Machine Calibration* (page 32).

1.3.4.4 Pitch And Focus

When a different pitch is selected, the ARRISCAN software calculates the new positions of sensor and optics to achieve the correct magnification while maintaining the focus position. Since different film types have different thicknesses, the focus position depends on the film type. The ARRISCAN stores a film type specific focus position offset to account for this. During automated scanning, the focus position is therefore adjusted when the film type changes. It is also possible to trigger an automatic refocusing operation during job processing.

1.3.4.5 Frame Size

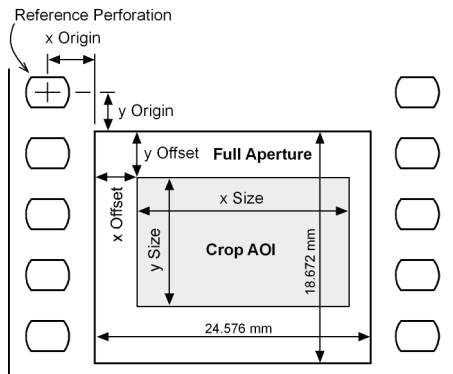


Figure 10: Measures used for positioning and sizing the scanned area.

Although there are standards for the framing of motion picture images, there is often the need to explicitly set the size and position of the area of the film frame that is scanned. In the ARRISCAN software, this area is called the crop AOI (Area Of Interest). The diagram above shows the properties that define the crop AOI using a 4-perf 35 mm film frame as an example.

Reference Perforation

The position of the frame is measured relative to the *reference perforation*, which is the perforation where the registration pin registers the film. This definition is also used by the ARRILASER film recorder.

Origin

The origin is the position of the top left corner of the film aperture relative to the center of the reference perforation. This value is standardized by the SMPTE (SMPTE 59 for 35 mm, SMPTE 201M for 16 mm). It is specified in mm.

Offset

The offset is measured relative to the top left corner of the standardized aperture. This property is used to specify a non-standard offset for the framing of the film. The offset is independent of the position of the aperture relative to the reference position, and therefore does not depend on the type of aperture (e.g. 3-perf or 4-perf). Since the offset relates to the digital image, it is specified in pixels.

Size

The size of the crop AOI also defines the size of the output image. Therefore, the size parameter is specified in pixels.

1.3.5 Calibration

The ARRISCAN uses a range of calibration techniques to ensure consistent image quality over time and between different scanners. The scanner can be calibrated with respect to light intensity as well as image geometry. Some calibrations can be carried out by the operator on a regular basis, while others are done at the factory.

Technically, a film scanner measures the relative transmission through the film. The baseline for the transmission calculation is determined in a calibration measurement without film. The scanner must also be calibrated for individual types of film to remove the tint of the film base and to optimize the exposure settings. In addition, the ARRISCAN's optical system is calibrated for magnification and film positioning. Finally, ARRI's color management technology is built into the ARRISCAN to provide color calibration on an absolute scale.

1.3.5.1 Machine Calibration

The machine calibration is a baseline calibration that is done without film in the gate. This is also called open-gate calibration. During the machine calibration, the illumination levels for all color channels are adjusted to the maximum level that can be achieved without overloading the sensor.

The machine calibration also measures the intensity distribution across the frame and saves calibration data that is used to compensate for any inequalities. Even though the ARRISCAN's illumination system was designed to illuminate the film as evenly as possible, in a real-world design some variation is inevitable and must be accounted for.

When the magnification of the imaging system is changed, the geometry of the optical path changes as well, which in turn affects the illumination of the film plane. Therefore, it is necessary to carry out a separate machine calibration for every pitch used for scanning. Pitches can be selected for calibration from a list in the ARRISCAN software, and the date and result of the last calibration is logged for every pitch.

1.3.5.2 Base + Lights Calibration

The unexposed clear base of camera negative film defines the lowest density that the film can record. The base is not neutral, and the tint of the base depends on the film type. In order to remove the tint of the base, a calibration measurement is done on an unexposed section of the film. Since the ARRISCAN can control the intensity of each color channel separately, it can compensate the base tint by adjusting the light levels so that the light is neutral after it has passed through the base. This is done by automatically tweaking the light levels so that the sensor is exposed as much as possible without saturating for each color channel. This also means that the exposure is optimized to utilize the entire dynamic range of the sensor, which maximizes the signal-to-noise ratio of the image acquisition process.

1.3.5.3 Geometry Calibration

A film scanner must be capable of reproducing an image on the film without adding to the positional jitter that was introduced by the camera when the film was exposed. In addition, if the same frame is scanned twice, the images should match even if they are scanned at different times on different scanners. With motion picture film, the tolerances for reproducibility are quite stringent since any positional jitter is more apparent in a sequence of moving images. The mechanical rigidity that is required of the optical system is comparable to that of a microscope. But it is also necessary to ensure that components can be aligned reproducibly. This applies to the alignment within the film plane as well as to the positioning of the optics and sensor which determines the magnification.

In order to meet these requirements, ARRI has developed a software-based geometry calibration procedure. The calibration uses custom-designed calibration patterns on a glass plate that can be placed in the gate of the scanner. A pattern-matching software algorithm evaluates the calibration patterns at different settings of optics and sensor and calculates a calibration curve for the magnification of the optical system, as well as an offset calibration for film positioning. This is done at the factory before the ARRISCAN is delivered. The calibration is also checked by ARRI service engineers when the scanner is set up at the client's facility. After that, the scanner is calibrated and stable, and the geometry calibration does not need to be repeated unless the mechanics require servicing.

1.3.5.4 Film Calibration

ARRI calibrates each scanner with a set of test films. The set comprises 26 different camera negative stocks and two intermediate stocks. On each test film there are 96 patches with different red, green, and blue densities. The patches are measured with a transmission spectrometer to obtain ISO *Status M Densities* and SMPTE *Printing Densities*.

Since the spectral response of the ARRISCAN matches neither Status M nor Printing Densities exactly, the measurements of the scanner need to be converted to obtain output data that is standards compliant. The conversion is possible because each film stock consists of a limited set of dyes. A conversion matrix, or *colormap*, is used to apply the conversion. The ARRISCAN is shipped with colormaps for the 26 test stocks that were calculated from the measurements of the test patches.

The signal output of the camera in the ARRISCAN is correlated to the transmittance of the negative film. Since the conversion is best applied to densities, the camera data is first converted to a logarithmic scale with a Look-Up Table (LUT). After the matrix conversion the data is converted back to a linear scale.

Status M vs Printing Densities

Status M is the standard for densitometric measurements of color negative film. When calibrated in Status M, the code values in a Cineon file correspond directly to measurements made with a densitometer.

Imagine a densitometer whose light source has the same spectrum as the light source in an optical printer, and whose detectors for the red, green, and blue channels have spectral sensitivities identical to those of print film. Such a densitometer would directly measure the densities as they are 'seen' by the print film. These densities are called *printing densities*.

In practice, an exact duplication of printer characteristics is not possible because of the large variety of printers and materials that exist. However, the SMPTE released a different set of spectral response curves in its standard RP 180. In this standard it states that 'The practical goal ... is to require that the printing density measurement correctly specifies the printing gammas of typical motion-picture color negative and intermediate materials.'

1.3.6 The Processing Chain

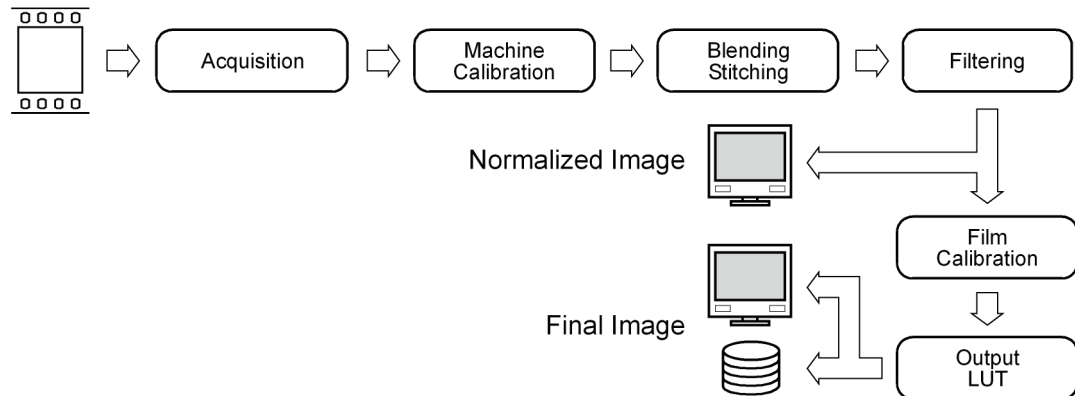


Figure 11: The ARRISCAN's image processing chain.

The figure above shows the sequence of image processing steps that are applied to an image between acquisition of the data by the sensor and storing the final image file on disk. The image originates on film. At the end of the chain, the processed data is saved to the storage system.

Acquisition

At the beginning of the processing chain, the image is acquired by the sensor and transferred to the digital domain.

Machine Calibration

The calibration data that was collected during the *machine calibration* (page 32) is applied to the unfiltered image. The resulting image contains calibrated linear data that corresponds to the amount of light transmitted by the film. This transmittance data is an accurate representation of the image on the film, but is not suited for the common DI postprocessing chain (see *Normalized Image* below).

Blending And Stitching

As discussed in *Dynamic Range* (page 24), the ARRISCAN acquires two images at different illumination levels for every frame. The two images are blended into a single image with extended dynamic range after the machine calibration. If *microscanning* (page 26) is active, the images that were acquired at different sensor positions are then stitched together into a single image with extended resolution.

Filtering

The calibrated, blended and stitched image is then processed by the sharpness and *oversampling filters* (page 26).

Normalized Image

At this stage in the processing chain, the image has the final output resolution, but still contains linear film transmittance data. This image is called the *normalized image*.

Although the normalized image contains the full information that was captured of the film, it will not appear correctly when viewed on a monitor because it does not have any gamma correction applied to it. If the image originated on negative film, it also appears inverted.

The ARRISCAN GUI has an option to view the normalized image. This can be useful for analyzing the image quality. In addition, all further processing steps can be bypassed so that the normalized image data is written directly into the final output file.

Film Calibration

The machine calibration ensures that all images that were scanned on the same scanner have the same intensity reference. However, there can still be differences between different scanners. The *film calibration* (page 33) applies a colormap to convert the image data into a standardized color space. After this processing step, the image contains linear transmittance data that is calibrated to an absolute reference.

Output LUT

Most image file formats store the image data in a specific representation. For instance, the Cineon format stores images as 10-bit logarithmic data, which is converted from 16-bit linear data by a special algorithm. Files that contain linear image data are usually expected to represent the color information according to some standard such as Rec. 709.

The data conversions necessary for conforming to different file formats are applied by means of Look-Up Tables (LUTs). For some formats such as Cineon, the conversion tables can be tweaked by a number of user-adjustable parameters. This is the final processing step.

Final Image

The *final image* is the image data that is saved into the output file. This image is also displayed in the ARRISCAN GUI.

1.3.7 SpeedPack 1

The SpeedPack 1 option increases the scanning speed of the ARRISCAN by adding a number of modifications to both hardware and software:

- A separate high-speed data path increases the transfer rate of data between image acquisition hardware and host computer.
- Hardware synchronization between light source, camera, and film transport eliminates communication overhead between components.

1.3.7.1 The SpeedPack Data Path

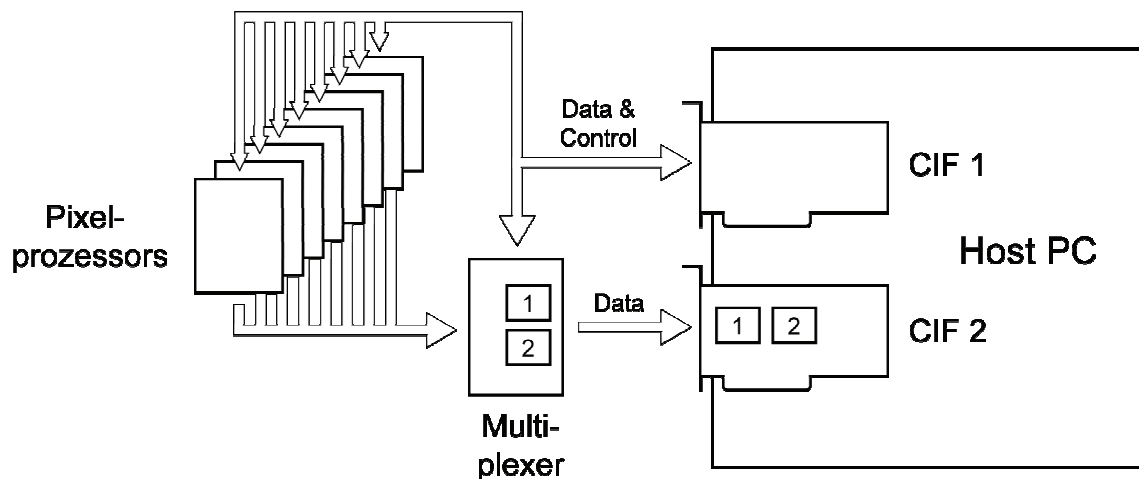


Figure 12: The data Flow in the ARRISCAN.

The diagram above shows the data flow in the ARRISCAN. Image data from the camera is processed in parallel by custom designed pixel processor boards. Data and control signals are passed between the scanner's hardware processing boards and the host PC via custom designed interface boards, the CIF cards. A standard low-speed machine only has a single CIF card, labeled CIF 1 in the diagram above. The CIF 1 card is connected to the ARRISCAN's standard data and control bus. The data rates on this bus allow scanning speeds of up to 1 frame per second.

The SpeedPack adds a second interface card, the CIF 2 card. This card looks identical to the CIF 1 card, but internally it is configured differently to allow high-speed data transfer over a separate fast data bus. In this setup the CIF 1 card is used only to control the hardware while the CIF 2 card receives data from the image processing hardware.

In addition to the CIF 2 card, a multiplexer board is added to the scanner's image processing hardware. This board reads data directly from the pixel processors and buffers it internally so that the processors can start working on the next frame while the previous frame is transferred to the host PC. The CIF 2 board also has two buffers so that while a frame is transferred to the board, the previous frame can be written into the host PCs memory via DMA (Direct Memory Access). Data rates on the ARRISCAN's custom processing hardware exceed 10 GB/s. The pixel processors reduce the data from the camera so that the maximum transfer rate of the PCI-X bus of about 400 MB/s is sufficient to achieve a frame rate of over 8 fps.

1.3.7.2 Optimizing Performance

The high data throughput rate of the SpeedPack data path is demanding processing power and file system throughput. If these requirements cannot be sustained, the scanning frame rate may drop. The highest system loads occur when scanning in single exposure mode, especially when proxies are active. There are a number of factors that can affect system performance:

- Only the ARRISCAN software should be running during job processing. Especially background file copying and image processing (rendering) can severely affect system performance. Linux provides a number of system monitors that display the system load. The graphical tool `xosview` gives detailed information on all aspects of system performance. The shell command `top` can be used to load the demand placed on CPUs and memory by individual processes. During single exposure job processing, the process `MeDamond` should consume 99% of CPU time, and the total load average should be around 8. If problems with system performance are suspected, ARRI support may ask for a copy of the output of `top` during job processing.
- The destination file system must be able to sustain the data rate at which output files are written. The ARRISCAN's write speed can exceed rates of 100 MB/s in single exposure mode, especially when proxies are active. File system throughput problems cause the ARRISCAN's internal file buffer, the *Save Queue* (page 269), to fill up. The save queue's fill level is displayed in the *Job Processing Info Bar* (page 147). File systems compatible with single exposure scanning include
 - locally attached RAID's with at least three drives
 - SAN systems attached via FibreChannel
 - NAS systems attached via InfiniBand

The following will *not* sustain data rates required for single exposure scanning:

- 1 GB Ethernet networks (unless channel bonding is implemented)
- FireWire or USB drives

Note that with current hardware it is not possible to sustain full acquisition speed when using DICE in single exposure mode.

1.3.8 Infrared Based Defect Correction (DICE)

The ARRISCAN contains a fourth color channel, which uses infrared light. Color film does not absorb light in this wavelength range, but any dust or scratches on the film do. Therefore, only defects appear in the infrared channel.

There are different methods to use the information from the infrared image.

- Not all defects block the light completely. An example of this are scratches that may have damaged the film, but there is still some image information left. In these cases, the information from the infrared image can be used to reconstruct the image at the defect.
- Large defects where all image information is lost must be handled differently. Automatic restoration methods include reconstruction of the image from adjacent frames. Another option is to repaint the missing parts by hand.

Kodak has developed a technology called Digital ICE (DICE) which implements the first method to remove scratches. Originally designed for still images (and now a standard feature of virtually all photographic scanners), this technology was adapted to moving images for the ARRISCAN. It delivers an extremely accurate correction for the most common defects. DICE is seamlessly integrated into the ARRISCAN's data path. When activated, scanning becomes slightly slower due to the additional color channel that needs to be captured. However, the resulting images are virtually free of defects. Hardly any additional dust busting is required.

As explained above, although DICE is perfect for defects where image information is still available, it cannot handle large defects. For such defects, a defect map can be saved, which can be loaded into third party applications such as Lustre. These applications can then pick up the defect automatically from the defect map and correct it automatically. Since only real defects are contained in the map, this process is much quicker and less error prone than traditional methods where applications tried to calculate their own defect map from the contrast of the RGB image.

A license from Kodak must be obtained in order to use DICE. See *Licensing DICE* (page 252) for details.

1.4 The ARRISCAN Workflow

The workflow describes the flow of information and data through the postproduction chain. This affects the way people cooperate and how data is managed within a facility. This section describes the fundamental philosophies behind the ARRISCAN's approach to workflow integration.

1.4.1 Types of Users

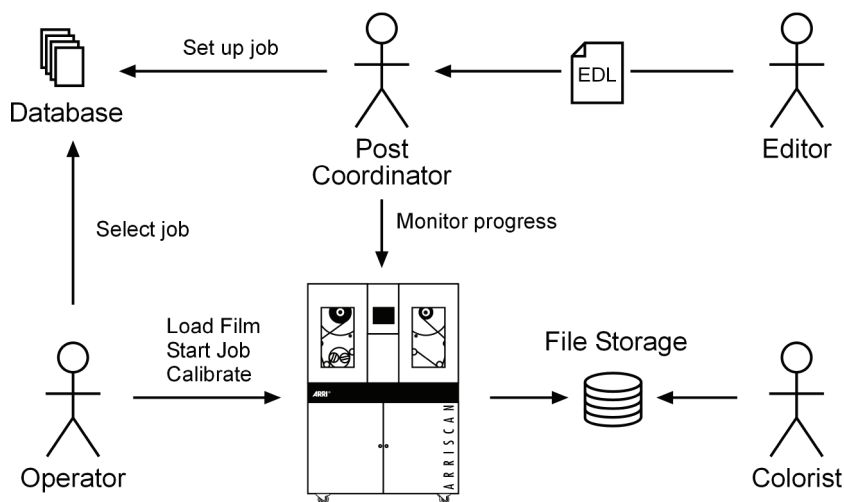


Figure 13: The standard ARRISCAN workflow

In most facilities, the digital intermediate process follows a scheme similar to the one shown above. The figure shows different people's roles within the postproduction process. In practice, different roles may be played by the same individual, or a role may be divided among several individuals such as assistants.

Editor

The editor edits the film on a digital editing system (e.g. an Avid). The image data that is used to make the edit decisions usually originated on a telecine, where the entire material that was shot on set was transferred to tape in video resolution (standard definition or SD). After the edit is finalized, the editor exports the edit information as an Edit Decision List (EDL) file. This is a text file containing information about which sections of the original material appear where in the final movie. The sections are usually identified by reel name and time code. The information in the EDL therefore identifies the bits of film that have to be scanned in high resolution for the digital intermediate process.

Post Coordinator

The information in the EDL must be imported into the ARRISCAN's database. This is often done by a coordinator who supervises the digital intermediate process. In order to do this, the coordinator may wish to monitor scanner activity to check for progress on unfinished jobs.

Operator

The scan operator checks for new jobs in the database, loads the corresponding reels into the scanner, and starts the jobs. At regular intervals, the operator also calibrates the scanner to ensure color correctness throughout the project.

Colorist

The scanned images are stored on a file system. In the digital intermediate process, the scanned images are color graded on a digital grading system optimized for the resolution and dynamic range of motion picture film (usually a software based system such as Lustre). The colorist loads the image data into the grading software from the file storage system. In order to speed up processing, grading is often done on lower-resolution proxy files that are generated from the original full-resolution data. The ARRISCAN can generate such proxies directly while scanning.

When the grading process is finished, the colorist renders the film to full-resolution files, which are then recorded back out to film on a film recorder.

1.4.2 Settings Management

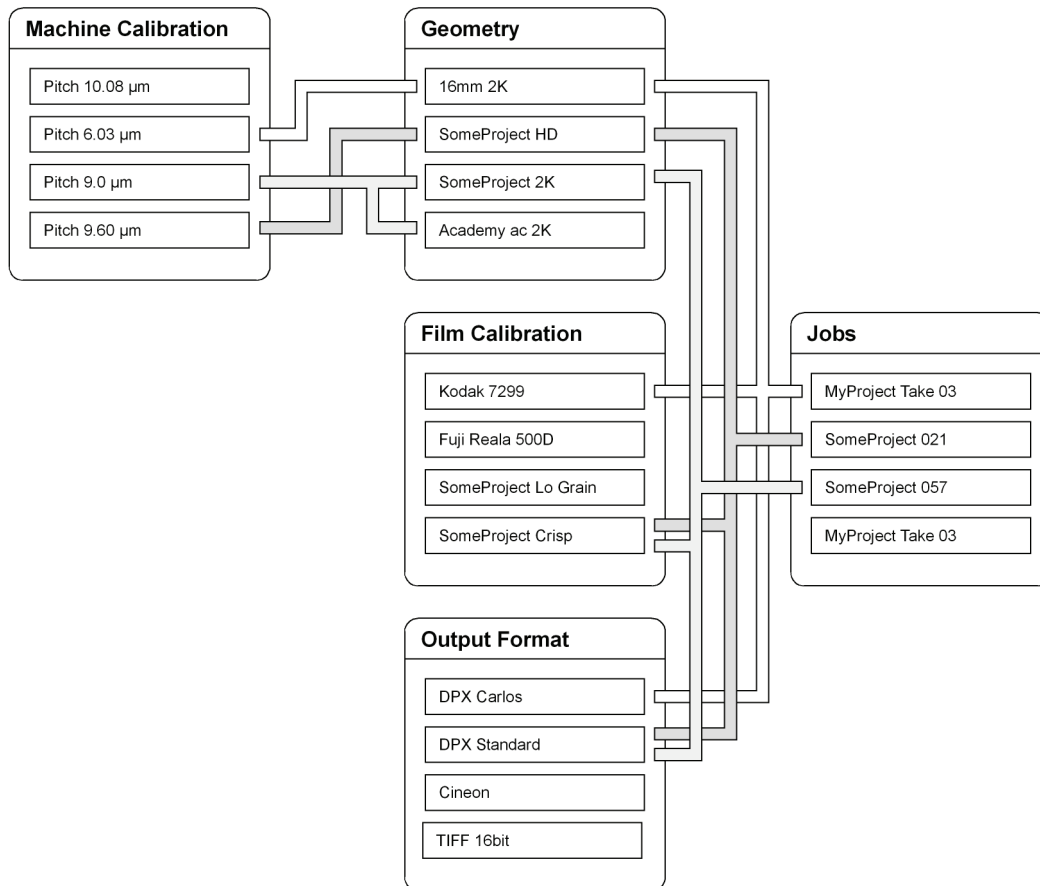


Figure 14: Relationships between jobs, settings, and calibration data in a typical ARRISCAN environment

When setting up the system for scanning, there are often settings that are shared between different jobs. Some settings are project specific, others are more general. The ARRISCAN uses a relational database to manage settings.

The figure above shows how settings relate to jobs and to calibration data. Each large box in the figure corresponds to a database table, and the rectangles inside each box represent an entry in that table. The figure shows how information is shared by linking between different databases. The purpose of each database table is described below.

Machine Calibration Table

The Machine Calibration database table stores the calibration data for different pitches. The reasons why separate calibrations are required are given in *Machine Calibration* (page 32).

Geometry Table

The Geometry table stores the following properties:

- The size of the final image.
- The position of the saved image data relative to the film frame.
- The magnification (pitch) at which the image is acquired.
- The oversampling mode to use.
- The microscanning mode to use.

Film Calibration Table

The Film Calibration table stores the calibration settings that depend on the film type. These consist of:

- The illumination settings for compensating the base tint.
- The focus position offset; see also *Pitch And Focus* (page 30).
- The filter settings (e.g. sharpening).
- The color management settings.

Note that film calibrations are linked to specific film types. They can also be linked to projects, so that each project can have its own specific calibration settings for each film type.

Output Format Table

The Output Format table stores the file formats and the format specific settings of the output files.

Job Table

The Job table stores the information about what is to be scanned. This includes:

- The in-point and out-point of the sequence of images to be scanned.
- The geometry, film calibration, and output format to use.
- The locations where the output files are to be stored.

The figure above shows how the information about geometry, film calibration, and output format is stored as links to corresponding entries in the other database tables. If for instance different job entries link to the same entry in the Output Format table, changes that are applied to the output format automatically apply to all job entries that use this output format. In addition, the entries in the Geometry, Film Calibration, and Output Format tables serve as presets that can be used when creating new job entries.

1.4.3 Projects, Reels, Jobs

Project

A project corresponds to the final film. It is used to collect the information for all frames that need to be scanned to assemble the film.

Reel

Each project can contain an arbitrary number of reels. A reel corresponds to an actual film reel. The name of the reel is used to identify the reel from which a job is to be scanned.

Job

Each reel can contain an arbitrary number of jobs. A job contains the frame position where scanning is to commence, and the number of frames to be scanned, as well as the acquisition and calibration parameters for scanning.

2 **Operating the ARRISCAN**

This chapter contains step-by-step guides to the operation of the ARRISCAN. The first part, Basic Scanning, covers the fundamentals of operating the ARRISCAN and starting a scan job. The second part, Setting Up, describes how to set up your own image geometry, film calibration, and output format. The third part, Calibration Procedures, deals with advanced calibrations that normally do not occur in everyday scanning.

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Calibration Procedures	61

2.1 Basic Scanning

This section is a quick-start guide to operating the ARRISCAN. The background to the technology and system architecture is described in *Understanding the ARRISCAN* (page 9). A detailed reference to all software controls can be found in *Software Reference* (page 65).

2.1.1 Starting Up

⦿ Switch on the scanner

Use the switch labeled "Main Power" at the back of the scanner to switch on the ARRISCAN.

⦿ Switch on the host PC

1. After switching on the host, turn on the touch screen with the external switch labeled "Touch Screen" at the UPS (Uninterruptible Power Supply).
2. At the Linux boot selector, make sure that the selected kernel is: Red Hat Enterprise Linux, kernel version 2.6.9-34
3. Use the keyboard attached to the host PC, log into the system as user "arriscan". When the system is shipped, the password is set to "arriscan".

For system administration tasks, a root login is required. To log in as root, open a terminal window, type `su -`, and enter the root password (default: `!metis`).

⦿ Switch on the remote PC

Start the remote PC, then connect to the host PC through the XWin X server.

You can do this by pressing the shortcut  on the Windows desktop, or from a Cygwin command line:

```
XWin :0 -nodecoration -query 10.0.0.1
```

⦿ Load the firmware

The firmware is automatically loaded when you boot the host PC. Therefore, it is not necessary to load the firmware if the host is switched on after the scanner.

If the scanner was switched off, it is necessary to reload the firmware into the scanner's electronics. To do so, execute the script `load_all.sh`, either in a

terminal window or by clicking  on the desktop of the `arriscan` account. The process takes about a minute.

⦿ **Start the daemon**



Click MeDaemon on the desktop to start the ARRISCAN daemon.

If the daemon does not start, check the error messages printed by the daemon. Usually, an instance of the daemon is already running or the firmware is not loaded.

⦿ **Start the GUI**



Click Marvin on the desktop to start the ARRISCAN GUI.

⦿ **Let the scanner warm up!**

The scanner must warm up for at least 20 minutes before it can be used! This is necessary to ensure that all electronics are at a stable temperature. Otherwise, there may be problems with the calibration of both film transport and imaging system.

2.1.2 Shutting Down

You can shut down the host either from the command line or in the graphical user interface.

⦿ **Shut down the host (from command line)**

1. Open a terminal window and log in as root. To log in as root, type `su -`, and then enter the root password (default: `!metis`).
2. Shut down the machine with `shutdown -h now`. To restart the machine automatically after the shutdown, use `shutdown -r now` instead.

⦿ **Shut down the host (in graphical user interface)**

You can shutdown the host in the graphical user interface only on the host PC. On a remote PC or with remote login, this is not possible.

1. Log out on the Linux Start Menu.
The Red Hat Linux login is prompted.
2. Select Shutdown or Reboot. You need to enter the root password to initiate the shutdown process.

⦿ **Switch off the scanner**

Use the switch labeled "Main Power" at the back of the scanner to switch off the ARRISCAN.

2.1.3 Loading Film

⦿ Feed in the film

1. Open the gate and feed in the film with emulsion side up as indicated on the panel below the left feeder plate.
2. Tense the film carefully and close the gate latch.

Do not use stickers to fix the film onto the core, as this can cause damage to the scanner when unloading the film.

⦿ Close the scanner lid

The scanner lid has to be closed to avoid injury while the film transport is operating.

⦿ Load the film

1. Press  to open the *Film Transport Setup Dialog* (page 113).
2. Select the film core size, the number of perfs per frame, the wind mode, and the PTRs accordingly.
3. Press  to close the dialog and load the film.

When using PTRs, make sure that they are clean. If needed, they can be cleaned with water and soap. After cleaning, make sure they are dry before you use them again for scanning.

⦿ Find the reference frame

1. When the film is loaded, open the scanner lid and the gate.
2. Press  to switch on the illumination in order to see the frame in the gate when locating the reference frame.
3. Press  (or L) or  (or J) to wind temporary forward/reverse or press  (or 4) or  (or 3) to step frame-wise forward/reverse to locate the reference frame.
4. Press  (or CTRL+6) or  (or CTRL+5) to step perf-wise forward/reverse to align the frame in the gate.
5. Close the gate and press  (or S) to verify that the reference frame is 'in rack'.

⦿ **Set reference frame number**

Press  to open the *Set Reference Position Dialog* (page 115). Type in your reference frame number or time code.

⦿ **Close scanner lid and doors**

With open doors, the winding speed is limited to 0.3 m/s. Make sure doors are shut tightly if the scanner appears to wind too slowly.

The scanner lid and doors have to be closed to avoid injury during the operation of the scanner.

2.1.4 Scanning a Preview

This section explains how to select an already defined geometry, film calibration, and output format for a preview scan.

⦿ **Select the geometry**

Select the desired geometry in the *Geometry Panel* (page 124). You will find the **Geometry** panel on the **Acquisition** tab in the lower tab area. For detailed information about how to create your own geometry settings, see *Setting Up the Geometry* (page 53)

⦿ **Select the film calibration**

Select an appropriate film calibration for the currently loaded film in the *Film Calibration Panel* (page 131). You will find the **Film Calibration** panel on the **Acquisition** tab in the lower tab area. For detailed information about how to create your own film calibration, see *Setting Up a Film Calibration* (page 54)

⦿ **Select the output format**

Select the desired output format in the *Data Format Panel* (page 137). You will find the **Data Format** panel on the **Output** tab in the lower tab area. For detailed information about how to create your own data format, see *Setting Up the Output Format* (page 57).

⦿ **Scan a preview**

Select the *Preview* (page 73) tab and press  (or S) to scan a preview.

2.1.5 Setting Up a Job

⦿ Create new Project/Reel/Job

1. Press  inside the *Job Editor* (page 89) to open a new dialog with the job setup. To copy the job settings from an already created job, select the job in the Project Browser, and then press .
2. Type in or select your project, reel, and job name. For details, see *Job* (page 94).
3. Set your first frame and the last frame or length of the sequence to be scanned. You can also edit this information as time code or key code if needed. For details, see *Start/Stop* (page 94).
4. Choose the desired templates for geometry, film calibration, and output format, see *Acquisition* (page 95). You can press  to copy the current settings from the corresponding panels in the lower tab area to the Job Editor.
5. Select the mount point. For details, see *File Setup* (page 96).
6. Edit the path and file name for the high-resolution files (with and without DICE). Optionally, you can also enter the path and file name for the proxy files, the defect map, the job log file, and the job log header.

The text after the last slash of the path is treated as file name. The file name has to follow the naming conventions. You can also use variables - see *File Setup* (page 96) - which are resolved during job processing. For example, `filename.%04d.dpx` directly inserts the frame count using four digits and results in file names such as `filename.0001.dpx`. `%05d.dpx` results in file names such as `00001.dpx`. For details, see *File Setup* (page 96).

7. Press .

⦿ Start Job Processing

Press  (or G) to open the *Start Job Processing Dialog* (page 117) where you can select the reel or job you want to start scanning. You can choose between three different scanning types: Frame-based (Time Code, press ALT+F), Key Code-based (press ALT-K), and Complete Reel (press ALT+C).

When editing parameters in the Job Editor, you do not have to save the new settings explicitly. The database is updated automatically.

2.1.6 Exchanging the Gate

If your ARRISCAN has the gate protection print (GPP) installed, this can be done without switching off the ARRISCAN.

The gate and the two loop builders must be changed for scanning different film gauges (35 mm or 16 mm).

- ⊙ **Press  to open the Film Transport Dialog**

- ⊙ **Power off the gate**

Press  to power off the gate.

- ⊙ **Retract the illumination**

Push the lever at the right of the illuminator and flip down the illuminator. This is necessary to protect the surface of the glass on the illuminator's exit port when the gate is exchanged.

- ⊙ **Remove the gate**

Using a 4 mm allen key, loosen the two screws that fix the gate to the scanner's optics console. Note that you cannot pull the screws out. They are secured to the gate. When the screws are loose, carefully extract the gate.

Be very gentle when extracting the gate to avoid damaging either the surface of the gate or the two sprockets right next to it.

- ⊙ **Insert the other gate**

Put the second gate in position and push it carefully against the optics console. There will be some resistance due to the electrical connectors at the back of the gate. Using the allen key, tighten the two screws firmly to lock the gate in place.

Again, be very gentle when inserting the gate to avoid damage to the surface of the gate or the two sprockets right next to it.

- ⊙ **Restore the illuminator**

Flip the illuminator back up until it clicks into position.

- ⊙ **Exchange the loop builders**

Remove the two loop builders by loosening the thumb screws on each loop builder. Put the second set of loop builders into place and tighten the thumb screws.

When removing and inserting the loop builders, make sure that the bolts at the bottom of each loop builder make contact with the end switches at the bottom of the optics console. Be careful not to damage the switches.

④ **Power on the gate**



Press  to power on the gate. The parameters of the new gate are imported to the database.

After changing the gate, a machine calibration is required.

2.2 Setting Up

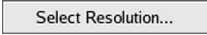
This section provides information about how to set up a ARRISCAN:

- *Geometry* (page 53)
- *Film calibration* (page 54)
- *Output format* (page 57).

A detailed reference to all software controls can be found in *Software Reference* (page 65).

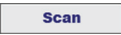
2.2.1 Setting Up the Geometry

⦿ Select the resolution

1. In the *Geometry Panel* (page 124), press  to open the *Select Geometry Format* (page 126) dialog.
2. Select the desired resolution preset. The names consist of the width of the scanned frame in pixels, e.g. 2048 and the corresponding area on the film, e.g. acFullap (Across Full Aperture).

You can resort the list by clicking on any column.

⦿ Scan a preview

Press  (or S) to scan the preview.

⦿ Change the image size and offset

Changing the image size can easily be done by just editing the x/y pixel size and offset.

1. Press  to update the crop marquee.

Alternatively, you can draw a crop AOI in the Preview using the viewer controls. For details, see *Viewer Controls* (page 76). Press  to copy the marquee values to the Geometry panel.

2. Press  to check the final output geometry.

See *Frame Size* (page 30) for more information on the ARRISCAN's handling of image geometry.

⦿ Save the geometry setting

Press  to save the geometry with a new setting name.

2.2.2 Setting Up a Film Calibration

Setting up the film calibration on the ARRISCAN includes the

- *base & lights calibration* (page 54)
- *focus calibration* (page 54)
- *colormap selection* (page 55)
- *filter settings* (page 56).

2.2.2.1 Base & Lights Calibration

⦿ Scan a preview

Press  (or S) to scan a preview.

⦿ Select the marquee mode

In the *Preview* (page 73), you select the most suitable marquee mode for drawing the base & lights AOI. For details, see *Viewer Controls* (page 76).

⦿ Draw the base & lights AOI

Draw a base & lights AOI across an image area where clear base is seen.

Clear film base can normally be found at the frame line. Press  (or CTRL+6) to offset the frame by one or two perfs, so that the frame line sits in the middle of the gate. Don't forget to press  (or CTRL+5) to offset the frame by one or two perfs to be '*in rack*' (page 267) again after the base & lights calibration.

⦿ Calibrate Base & Lights

Press the upper  button to initiate the calibration process. The status of this process can be followed in the progress window.

⦿ Save the calibration settings

Press  to save the calibration either with a new setting name or by selecting the one you want to update.

2.2.2.2 Focus Calibration

- ⦿ **Scan a preview**

Press  (or S) to scan a preview.

- ⦿ **Select the marquee mode**

In the *Preview* (page 73), you select the most suitable marquee mode for drawing the crop AOI. For details, see *Viewer Controls* (page 76).

- ⦿ **Draw the focus AOI**

In the display area of the *Preview* (page 73), use the mouse to draw the desired focus AOI across the previewed image.

The focusing algorithm picks up the film grain. If you are scanning intermediate film stock, consider that because of the fine grain, a structure with a minimum of contrast has to be chosen.

Make sure you use an AOI centered to the previewed image to achieve best sharpness.

- ⦿ **Calibrate the focus**

In the *Film Calibration Panel* (page 131), press the lower  button to initiate the calibration process. You can follow the status in the progress dialog that opens.

- ⦿ **Save the calibration settings**

Press  to save the calibration either with a new setting name or by selecting the one you want to update.

2.2.2.3 Colormap Selection

⦿ **Enable colormap selection**

Inside the *Film Calibration Panel* (page 131), activate the **Colormap** check box to enable the colormap selection button.

⦿ **Select the colormap**

1. Press the selection button next to the **Colormap** check box to open the **Select Colormap** dialog.
2. Choose the colormap that matches your film type.

The film type will be displayed in the status bar if a key code is detected.

There are two colormaps for each film stock: one that produces output data calibrated in Status M, and one that produces output calibrated in Printing Densities.

For in-depth information on colormap use, see *Film Calibration* (page 33).

⦿ **Save the calibration settings**

Press  to save the calibration either with a new setting name or by selecting the one you want to update.

2.2.2.4 Filter Settings

You need to know what kind of filter you want to apply. For in-depth information, see *Filter Type* (page 132).

⦿ **Select the filter type**

Inside the *Film Calibration Panel* (page 131), select the desired filter kernel from the **Filter Type** list. OCN-2 for Original Camera Negative and HICON for fine grain and high contrast material.

⦿ **Set the sharpening**

Use the **Sharpen** slider to set the amount of sharpening applied to the image.

⦿ **Set the offset**

Use the **Offset B** and **Offset R** slider to adjust the offset of the blue and red channel relative to the green channel.

⦿ **Save the calibration settings**

Press  to save the calibration either with a new setting name or by selecting the one you want to update.

2.2.3 Setting Up the Output Format

Setting up the output format on the ARRISCAN includes setting up

- the data format, see *Setting Up the Data Format* (page 57)
- Digital ICE (if applicable), see *Setting Up Digital ICE* (page 59)
- global settings, see *Setting Up Global Settings* (page 60).

2.2.3.1 Setting Up the Data Format

The ARRISCAN provides two main types of output formats: logarithmic and linear. For the latter format, you have a choice of storing the ARRISCAN's normalized image or to convert the data into a more useful representation using one of various output LUTs.

You can use different formats for High Res and Proxy images. If both images use the same format, they share the same settings. For more information about proxies, see *Proxy Scanning* (page 173).

⦿ **Select the image type(s)**

In the *Data Format Panel* (page 137), activate the **High Res** check box to produce image files at the full output resolution and/or the **Proxy** check box to produce smaller files for preview.

⦿ **Select the file format**

In the drop-down menu next to the **High Res** and **Proxy** check box, select the desired file format.

You can select between

- Logarithmic file formats
- Linear File formats without custom LUTs (normalized)
- Linear File formats with custom LUTs.

Logarithmic File Formats

⦿ **Select the logarithmic file format**

In the drop-down menu next to the **High Res** and **Proxy** check box, select **Cineon 10-bit log** or **DPX 10-bit log**. The normalized raw image is inverted and converted to a logarithmic image according to the gain factors and the base offset.

⦿ **Set the gain factors**

When using a logarithmic format, you have the option to edit the Cineon *gain factors* (page 137). The factors will show up next to the file format menu with values for red, green, and blue.

⦿ **Select the base offset**

Next to the gain factors, you can edit the code value for the film *base* (page 138).

⦿ **Set the IP conversion**

The last option you have is the *interpositive conversion* (page 138). If this is enabled, the image data is not inverted. When scanning interpositive material, you cannot use the standard base calibration since it is designed for negative film. To compensate for this, the IP conversion mode offers manual controls for adjusting the illumination. This is done by setting the offset values in units of printer lights for the red, green, and blue color channels. While making adjustments, you can monitor the color values of individual pixels in the viewer to check if the scan is neutral.

The offsets are specified in units of printer lights, not code values!

⦿ **Save the data format setting**



Press  to save the format under a new name or select the name of an existing format to overwrite it.

Linear File Formats without custom LUTs

⦿ Select the linear file format without LUT

In the drop-down menu next to the **High Res** and **Proxy** check box, select **DPX 16-bit norm** or **TIFF 16-bit norm**. These formats save the normalized image data (see *Normalized Image* (page 36)). For proxy images, you can save the image file also as **TIFF 8-bit norm**.

Images saved with these settings are not inverted!

⦿ Save the data format settings

Press  to save the format under a new name, or select the name of an existing format to overwrite it.

Linear File Format with custom LUTs

⦿ Select the linear file format with LUT

In the drop-down menu next to the **High Res** and **Proxy** check box, select one of the following:

- Cineon 10-bit custom
- DPX 10-bit custom
- DPX 16-bit custom
- TIFF 16-bit custom
- TIFF 8-bit custom (Proxy only)

⦿ Select the custom LUT

Next to the file format drop-down menu, you have the option to select a LUT that is applied to the image before it is saved to file. The LUTs that are part of the standard ARRISCAN installation are explained in *Custom File Formats* (page 139).

Note that with output LUTs, it is possible to save logarithmic data into a linear file format. Such files require special treatment in the postproduction chain.

⦿ Save data format setting

Press  to save the format under a new name, or select the name of an existing format to overwrite it.

2.2.3.2 Setting Up Digital ICE

Setting up Digital ICE is carried out from the *Output Format Panel* (page 137).

To use Kodak's Digital ICE technology, a commercial license has to be obtained.

For more information, see *Licensing DICE* (page 252).

For some film stocks, the correct film type has to be specified in order that defect correction can be applied properly.

☉ **Activate Digital ICE**

To activate Digital ICE, activate the **USE IR** check box. If Digital ICE is activated, the additional IR image is acquired during scanning, the high-resolution image is automatically corrected, and a defect map is generated.

☉ **Configure Digital ICE**

Click the **Defect Correction Settings** button. This opens the **Defect Correction Settings** (page 140) dialog, in which you can select, edit, and delete already existing presets and where you can create new presets.

☉ **Retain a Copy of the Uncorrected Image**

1. To retain such an image, select **on** in the **Save Original** list.
2. To set the desired location where the copy of the uncorrected image should be saved, click the **Job Editor** tab.
3. In the **Project Browser**, click the job whose settings you want to open in the **View Area**.
4. On the **File Setup** tab, enter the path in the **High Res Original** text box.

For more details, see *Defect Correction (Digital ICE)* (page 140).

2.2.3.3 Setting Up Global Settings

The only check box in this section provides you with the possibility to write non-standard DPX files, that is, files whose key Code information in the image header is not in count perf format. For details, see *Global Settings* (page 144).

☉ **Enable non-standard DPX file storage**

In the *Data Format Panel* (page 137), activate the **Store key codes using feet/frames (not compliant with SMPTE S268m-2003)** check box.

2.3 Calibration Procedures

This section deals with advanced topics that normally do not occur in everyday scanning (Exception: the machine calibration).

A detailed reference to all software controls can be found in *Software Reference* (page 65).

2.3.1 Calibrating the Machine

Calibrate the machine without film in the gate. We recommend a daily machine calibration, for example, every morning. To see the date and time of the last machine calibration, open the **Machine Calibration** panel.

- ⦿ **Unload the film (if necessary)**

Press  and spool out the film.

- ⦿ **Clean the film gate and the illumination**

Use only lens tissues and isopropanol alcohol.

- ⦿ **Close the scanner lid**

To avoid any kind of stray light, you should close the scanner lid before calibrating.

- ⦿ **Select the desired pitch**

Press the **System Calibration** tab in the lower tab area to open the Machine Calibration Panel. In this panel, multiple selections are possible. Each native pitch requires a separate machine calibration. Each selected pitch takes about 2 minutes to calibrate.

- ⦿ **Perform the calibration**

In the **Machine Calibration** panel, press **Calibrate** to initiate the calibration process. You can follow the progress of the calibration in the progress dialog that pops up. The calibration is finished once the line `Operation finished` appears in the progress dialog. You can now close the progress dialog.

Do not touch the ARRISCAN during the calibration process (leave doors closed, etc.)

- ⦿ **Perform the dust check**

1. Press  to display the gate check image in the display area of the *Preview* (page 73).

2. With the viewer controls, set the zoom factor of the display area to at least 100%.
3. Use the sliders to control the edge of the gate for fluff and dirt.
4. In case of fluff and dirt, clean the gate and perform the calibration and the dust check again until you have a calibration with no fluff and dirt.

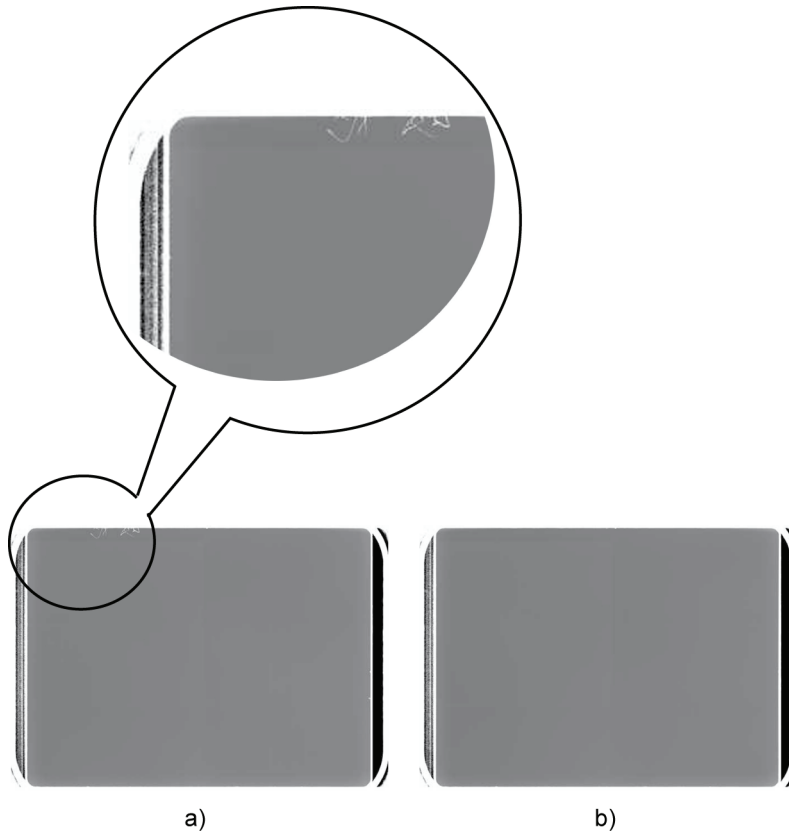


Figure 15: Image with dust a) and without dust b)

2.3.2 Calibrating the Scanner Geometry

The scanner geometry is calibrated using the calibration glass plate (delivered with each scanner). The calibration is carried out from the Geometry Calibration Panel. Geometry does only have to be calibrated by the user after hardware modifications and when advised by the service department.

2.3.2.1 Glass Plate Calibration

- ⦿ **Unload the film**

- ⦿ **Clean the film gate**

Use only lens tissues and isopropanol alcohol.

- ⦿ **Put the film transport into geometry calibration mode**

Press the **Frame Down, Pin Up** button in the Geometry Calibration panel. The button will stay depressed.

- ⦿ **Place the glass plate in the gate**

Make sure the glass plate is clean before placing it in the gate. The gate lid does not close all the way when the glass plate is inserted. Do not force the lid: it may break the glass plate!

- ⦿ **Start the calibration**

In the **Geometry Calibration** panel, press  to initiate the calibration procedure. The **Geometry Calibration** dialog opens.

- ⦿ **Select the lens type**

Select the currently installed lens type and click **OK**. Make sure that the selected lens type is the one currently assembled in the scanner. The calibration procedure now starts. Results are automatically written to the ARRISCAN's database.

Geometry calibration for 35 mm and for 16 mm are both performed with the 35 mm gate.

- ⦿ **Release the glass plate from the gate**

- ⦿ **Put the film transport back into normal mode**

Press **Frame Down, Pin Up** again (so that the button is not depressed any more).

After the geometry calibration, a machine calibration has to be performed.

2.3.2.2 Performing Offset Calibration

Offset correction

The following section applies mainly to facilities that operate more than one scanner.

There is a positioning tolerance when the glass plate is placed in the gate. This can lead to mismatches in the geometry offsets between different scanners. The **Offset x** and **y** values in the Geometry Calibration panel can be used to compensate for this. These offsets are specified in units of 3k pixels. To determine the offset correction values for multiple scanners, do the following:

- ① **Load a reference film on the first scanner**

- ② **Create a reference geometry on the first scanner**

Bring up an image that has a reference position that you can use for frame accurate positioning of the crop marquee. Select a 3k acquisition format. Run a preview scan and position your crop marquee so that the top left corner of the marquee sits on the reference position. Save the geometry.

- ③ **Load the reference film on the second scanner**

- ④ **Scan the reference frame using the reference geometry**

When the scanners are set up to use a central job database, the same geometries are available on all scanners.

- ⑤ **Check the positioning of the crop marquee**

If the top left point of the crop marquee does not sit on the reference position on the second scanner, use the **Offset x** and **y** controls in the Geometry Calibration panel to correct the positioning. You do not need to save the settings. They are automatically written to the ARRISCAN's database.

- ⑥ **Repeat for every scanner in the facility**

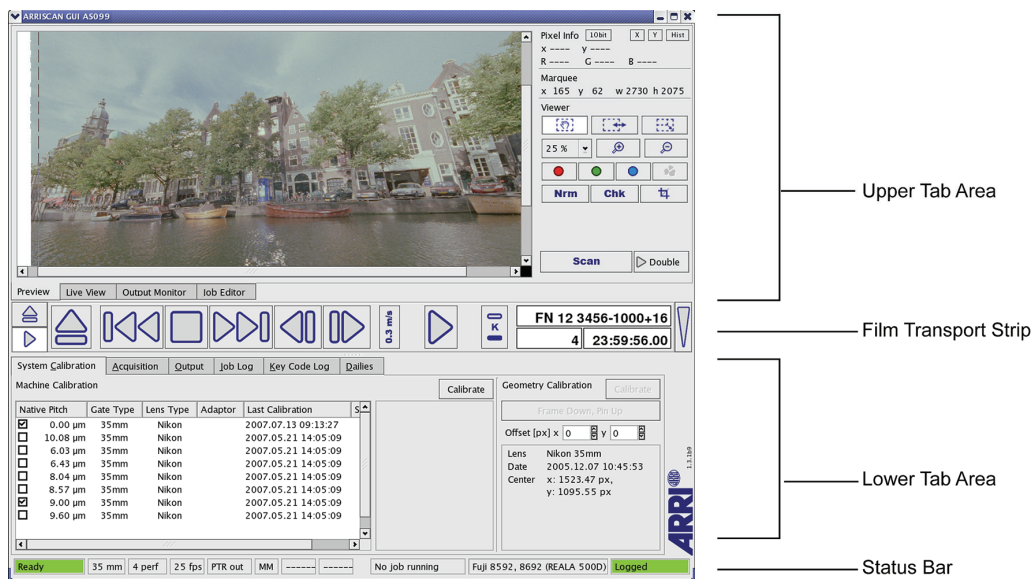
3 Software Reference

This chapter describes the ARRISCAN software in detail. The software was designed to be efficient to use with constant feedback of the system status at a single glance. It is based on a fully featured graphical user interface that allows the user to access all parts of the system from a single application.

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3.1 User Interface Concepts



The ARRISCAN GUI (Marvin) is an application that runs in a single window. There are no subwindows or dockable windows inside this window. Instead, the application is divided into panels containing tabs. Different panels can be accessed by switching between tabs.

The screenshot above shows the main application window. It consists of the following elements:

- *upper tab area* (page 67), providing tabs for setting up jobs, setting up the scanner for preview scanning, and displaying a preview of the last frame that was saved during job processing. With the Digital Dailies Base Package, an additional tab with a black and white live view while spooling is provided.
- *film transport strip* (page 67), providing controls for setting up and operating the film transport.
- *lower tab area* (page 67), providing tabs for performing the system calibration, setting up scanning parameters, defining the output file formats and settings, viewing a log of the scan job, and viewing a log of detected key codes.
- *status bar* (page 154), providing information on various system parameters.

The ARRISCAN can be operated using the same GUI via the scanner's touch screen or from a remote PC. To ensure convenient working in both cases, the ARRISCAN GUI is optimized with *touch screen support* (page 71).

To speed up operating, the ARRISCAN GUI provides several *keyboard shortcuts* (page 157).

The keyboard shortcuts are available only when operating the ARRISCAN from a remote PC.

3.1.1 Upper Tab Area

The tab area in the upper part of the main application window provides four tabs:

Preview	This tab opens the <i>Preview</i> (page 73). It is used while setting up the scanner for preview scanning and image analysis.
Live View (DD only)	This tab opens the <i>Live View</i> (page 83). It provides you with a black and white real-time image of your film while spooling.
Output Monitor	This tab opens the <i>Job Preview</i> (page 88). It provides you with an image of the last frame that was saved during job execution.
Job Editor	This tab opens the <i>Job Editor</i> (page 89). It is used for setting up the scanning jobs and checking the job settings.

3.1.2 Film Transport Strip

The film transport strip is located in the center of the main application window. It contains the film transport control buttons and the film position display. There is a narrow handle at the bottom of the strip that can be dragged to move the strip up and down, thereby changing the sizes of the upper and lower tab areas relative to each other.

The film transport strip is always visible to give feedback on the status of the scanner's mechanics and to make sure that the controls for starting and stopping the film transport are always accessible.

For more details, see *Film Transport Controls* (page 109).

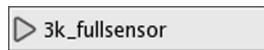
3.1.3 Lower Tab Area

The tab area in the lower part of the main application window contains panels for calibrating the scanner, setting up the image acquisition, defining the output files and monitoring the system status. It consists of five tabs:

System Calibration	This tab provides the Machine Calibration Panel and the Geometry Calibration Panel. The Machine Calibration Panel is used to calibrate the scanner and to view the calibration status. The Geometry Calibration Panel is used to calibrate the image geometry.
Acquisition	Contains the Geometry Panel and the Film Calibration Panel. The <i>Geometry Panel</i> (page 124) is used to set up the size, resolution, and position of the frame area to be scanned. The <i>Film Calibration Panel</i> (page 131) is used to set the calibration parameters that depend on the film type.
Output	This tab consists of the <i>Data Format Panel</i> (page 137). This panel is used to define the file format of the image files to be produced.
Job Log	This tab is used to monitor the automated processing of jobs. For more information, see <i>Job Log</i> (page 146).
Key Code Log	Provides a log of detected key codes and status information about the key code detection system. For more information, see <i>Key Code Log</i> (page 148).
Dailies	This tab contains functions for dailies scanning. The <i>Film Transport Panel</i> (page 151) is used to find the punch position at the beginning of a reel. The <i>Job Setup Panel</i> (page 152) is a GUI for logging jobs on the fly.

3.1.4 Selection Buttons

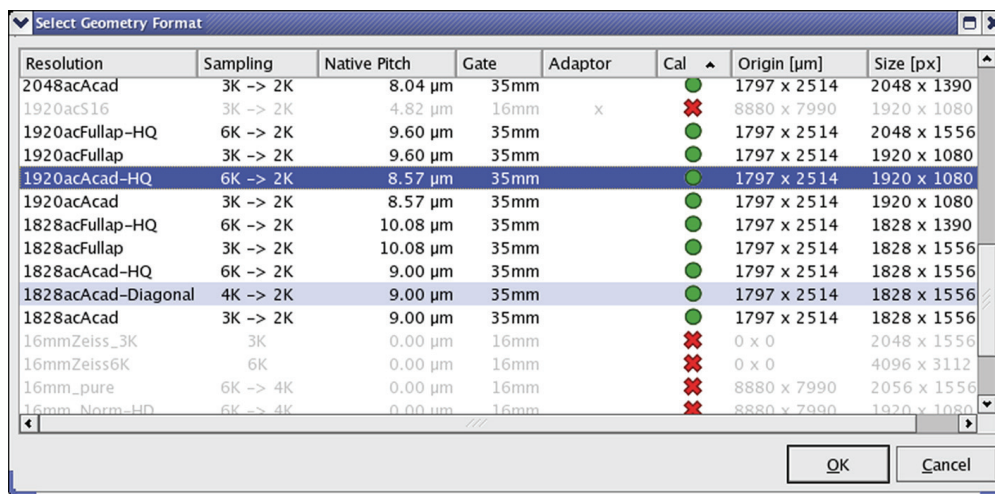
Many customized settings in the ARRISCAN GUI are set by selection buttons. These buttons can be identified by an icon  that is shown on the left of the button:



When the button is clicked, a selection dialog opens. In addition to the names of the available settings, the dialog shows some (or all) of the most important parameter values for each setting from the parameter database.

Only usable settings can be selected. If a setting is not usable, it appears shaded in the selection box, which indicates that it cannot be selected. In the example below, the geometry formats for a 16 mm gate cannot be selected.

The currently selected setting is highlighted in light blue, and the new setting in dark blue, as shown below:



The entries in the selection list can be sorted by clicking on any column header. Clicking the column header again switches the sort criteria from ascending to descending order and vice versa. This makes it much easier to find settings in the list.

Additional Options

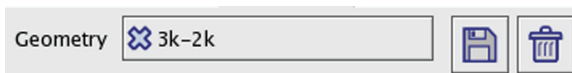
For some settings there are additional check boxes located at the bottom left of the selection dialog:



The example above shows a part of the Project Selection dialog in the Film Calibration panel. From this dialog, a project name can be selected. Similarly, the film calibration can be assigned to all projects by clicking **All**. Other dialogs that have extra selection buttons include the film calibration selection in the Job Editor, and the film type selection in the Film Calibration panel.

User Settings

Some settings can be changed by the user. If a setting has been changed but not yet saved, a cross is displayed next to the name of the setting.



This indicates that the changes cannot be used in job processing and will be lost if the daemon is stopped before they are saved. If a setting is modified by accident, the values that were last saved can be reloaded by selecting the same setting again in the selection dialog.

Settings are managed by the daemon. Therefore, the GUI can be restarted without losing changes to settings.

When running multiple GUIs, changes made in one GUI are immediately reflected by the others.

Some settings also provide buttons to save and delete settings:



Saves the current setting to the database. Before the setting is written, the software prompts for a name. You can type a new name to create a new setting or select an existing name to overwrite the corresponding setting.



Deletes the current setting from the database.

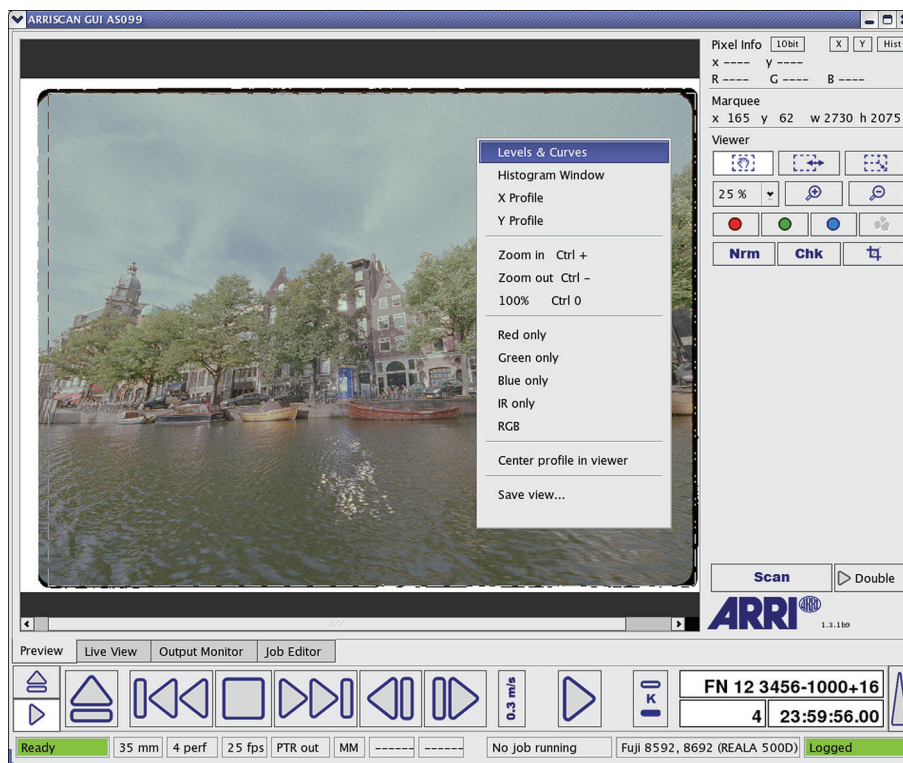
3.1.5 Touch-Screen Support



The ARRISCAN GUI is designed to run simultaneously on the scanner's touch screen and on a remote PC. The former is used mainly to load film and to set the reference frame (punch frame) while the latter is more convenient for calibrating, setting up jobs, and checking image quality. Since it is convenient to still have most functionality of the GUI available on the touch screen when needed, the ARRISCAN GUI is designed to be touch-screen friendly:

- The lower tab area of the main application window can be hidden by clicking the button to the right of the film transport controls (see screenshots above). This increases the image display area, which is convenient when setting up a scan on the touch panel.
- Some actions are awkward to perform on a touch screen. Therefore, the ARRISCAN GUI provides touch-screen friendly alternatives for such actions:
 - All important functions can be performed by buttons (since the context menu is not available on the touch screen). For example, the viewer's line profiles as well as the *Histogram Window* (page 79) can be accessed by buttons from the *Pixel Info Panel* (page 74).
 - Marquees can be dragged open anywhere on the screen in marquee drag mode. This is more convenient than trying to drag the edge of an existing marquee on the touch screen.
- The film transport buttons are extra-large for easy touch screen control.
- Some input fields (such as the one for setting the reference frame) display a keypad, which can be used to quickly type in a number on the touch screen. Of course, you can still use the keyboard on the remote PC.

3.2 Preview



The screenshot above shows the Preview tab with its context menu.

It consists of a large scrollable display area on the left and a control area on the right. There are also a number of functions that can be accessed through the *Preview's context menu* (page 78) as shown above.

The context menu is available only when operating the scanner from a remote PC.

In the Preview, you

- perform a manual scan of the frame that is currently located in the film gate and display this image, see *Display Area* (page 74).
- set the marquees for the output crop, the auto focus, and the base + lights calibration, see *Viewer Controls* (page 76).
- analyze the scanned image (line profiles, levels and curves, color channels), see *Image Analysis Functions* (page 79).

3.2.1 Display Area

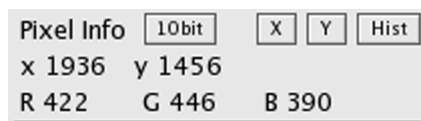
The display area shows the image that is being viewed. This is always the last image that was scanned for previewing by clicking the **Scan** button. The display area is also used to display and change the marquees for the output crop, the auto focus, and the base + lights calibration. Marquees are explained further in *Marquee Handling* (page 75) below.

There are a number of *keyboard shortcuts* (page 157) for navigating the viewer's display area.

Right-clicking into the display area opens the Preview's *context menu* (page 78). From this menu, you can access some of the *viewer controls* (page 76) as well as the *image analysis functions* (page 79).

The context menu is available only when operating the ARRISCAN from a remote PC.

3.2.2 Pixel Info Panel



The Pixel Info panel displays the color values of the viewer pixel at the current position of the mouse cursor. The position itself is displayed in the second line of the panel (*x* and *y*), and the code values for each color channel are shown underneath.

Don't confuse the *x* and *y* values of the current mouse position within the display area of the Preview with the frame size and position. A value pair of 0,0 in the Pixel Info panel means that the mouse position in the display area is on the pixel in the upper left corner of the sensor area. For more information, see *Matching Film Frame to Sensor* (page 27).

Besides the value displays, the Pixel Info panel provides the following buttons:

- | | |
|--|---|
| <div style="border: 1px solid black; padding: 2px; display: inline-block;">10bit</div> | Selects the resolution of the color value display. Available settings are 8, 10, and 16 bits per color channel. The bit resolution is independent of the image displayed. For instance, the 16 bit setting will work even if the image is displayed in 10-bit logarithmic format. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 5px;">X</div> <div style="display: inline-block; border: 1px solid black; padding: 2px;">Y</div> | Shows and hides the horizontal and vertical <i>Line Profiles</i> (page 80) in the viewer, respectively. |
| <div style="border: 1px solid black; padding: 2px; display: inline-block;">Hist</div> | Shows and hides the <i>Histogram Window</i> (page 79). |

The displayed color values do not reflect any contrast adjustments that are applied through the viewer's *levels and curves controls* (page 81). However, the file format parameters that are set in the *Data Format panel* (page 137) are taken into account.

3.2.3 Marquee Panel

Marquee

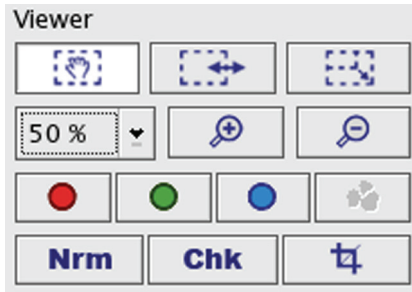
x 1091 y 699 w 1356 h 723

The coordinates (offset and size) of the viewer's marquee are displayed in the Marquee panel (shown above), which is located directly underneath the *Pixel Info Panel* (page 74). As in the Pixel Info panel, the origin of the x and y value pair is the upper left corner of the sensor area. This is not the same as the crop offset set in the *Geometry panel* (page 124).

The marquee defines an Area Of Interest (AOI) which is used for the base+lights calibration and for focusing. It can also be used to set the image crop as described in *Geometry Panel* (page 124). In addition, the *Histogram Window* (page 79) displays the histograms for the image area within the marquee in real time.

The marquee is shown as a dashed frame in the viewer. The dashes are animated to make it easier to distinguish the marquee from the image contents. You can manipulate the marquee with the mouse. There are three modes for doing this, which can be set with the *Viewer Controls* (page 76).

3.2.4 Viewer Controls



The viewer controls provide the following functions:

Viewer/marquee drag modes



Activates the *viewer drag mode*. In this mode, clicking and dragging the mouse in the viewer will move the section of the image that is visible in the viewer window. The marquee can be resized by dragging its edges and corners.



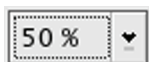
Activates the *marquee resize mode*. In this mode, clicking and dragging the mouse in the viewer will move the marquee. The marquee can be resized by dragging its edges and corners.



Activates the *marquee drag mode*. In this mode, clicking and dragging the mouse in the viewer will open a new marquee. This is particularly convenient on the touch screen, where it can be difficult to drag the edge of an existing marquee. It is also handy for checking the *histogram* (page 79) in different parts of the image.

The viewer's *keyboard shortcuts* (page 74) always work regardless of which marquee modification button is active.

Zoom Controls



Sets the viewer's zoom factor to the selected percentage.



Increases the zoom factor by one step.



Decreases the zoom factor by one step.

Image Controls



Displays a single color channel. To view all color channels, make sure all buttons are deactivated. To deactivate an active button, click on it again.



Displays the defect channel of the picture. The defect channel can be viewed only if the Kodak DICE defect map is activated in the *Data Format Panel* (page 137).



Displays the normalized image display, that is, the display of the raw scan data before any processing as defined in the output settings is applied. Click this button again to deactivate this display. Then the viewer shows again the image as it will be saved in the high-res output file.

See also *The Processing Chain* (page 34).



Displays the gate check image. This calibration image is taken for dust check when a machine calibration is made.

For more information, see *Calibrating the Machine* (page 61).

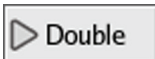


Displays only the image area that is saved to disk. This is the area that is set with the output crop marquee or in the *Geometry panel* (page 124). If the cropped image is displayed, the marquee is not visible.

Scan Controls



Scans a preview image of the frame currently located inside the film gate, with the settings activated in the lower tab area.



DD only

Sets the exposure mode either to single or double. The double exposure technique is the standard method of image acquisition for the ARRISCAN, resulting in scans of unsurpassed quality. However, it is also possible to acquire images with a single exposure only. In this mode of operation, the ARRISCAN is almost twice as fast at the expense of a higher noise level in the final image.

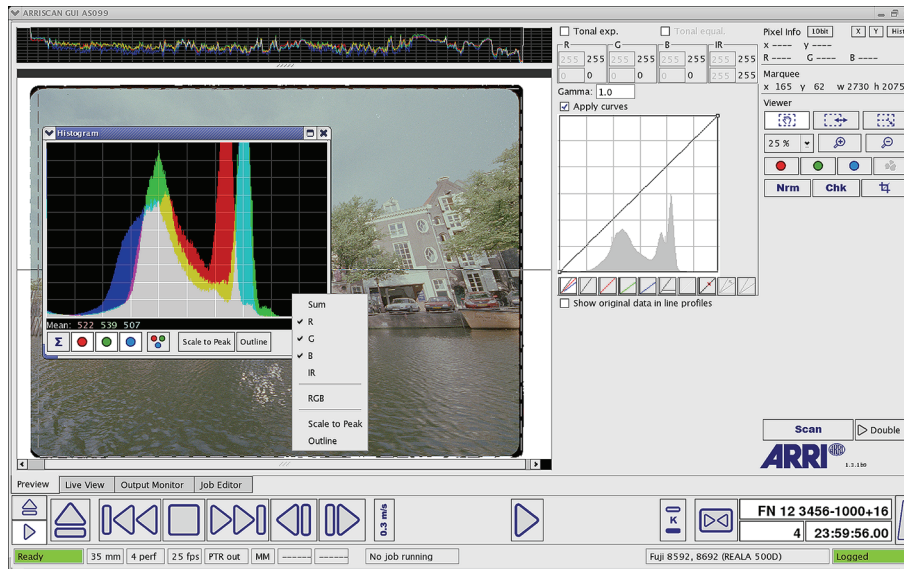
See *Dynamic Range* (page 24) for more information regarding single or double exposure.

3.2.5 Preview's Context Menu

The context menu offers several functions for the Preview.

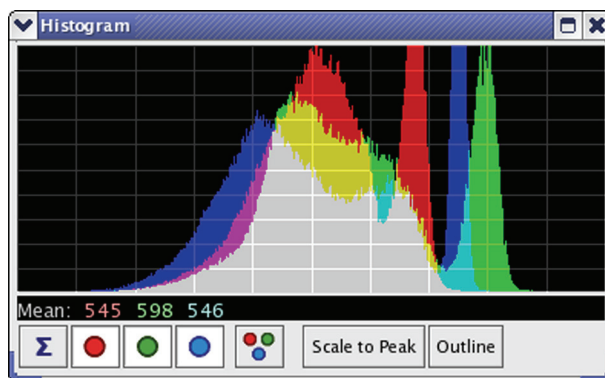
Menu Item	Description
Levels and Curves	opens the <i>levels and curves controls</i> (page 81)
Histogram Window (CTRL + C)	opens the <i>Histogram</i> (page 79) window
X Profile (CTRL + V)	shows the line profile in horizontal direction, see <i>Line Profiles</i> (page 80).
Y Profile	shows the line profile in vertical direction, see <i>Line Profiles</i> (page 80).
Zoom in (CTRL + '+')	zooms in
Zoom out (CTRL + '-')	zooms out
100% (CTRL + 0)	zooms to 100%
Red only (CTRL + R)	displays the red color channel only
Green only (CTRL + G)	displays the green color channel only
Blue only (CTRL + B)	displays the blue color channel only
IR only (CTRL + D)	displays the defect map (if DICE is activated)
Center profile in viewer (CTRL + ALT + L)	moves the profile line to the center of the display area
Save view	saves the displayed image to the location of your choice

3.2.6 Image Analysis Functions



The screenshot above shows the Preview with the image analysis tools activated. The analysis tools can be accessed through the Preview's context menu (right-click into the display area), some of the tools also through the buttons in the upper right part of the Preview.

3.2.6.1 Histogram



Open the Histogram window by clicking on the **Hist** button in the *Pixel Info Panel* (page 74) or by using the Preview's context menu. The window can stay open next to the main application window. It can be dragged anywhere on the screen and it will remember its position and size when closed.

The histogram is calculated for the image area enclosed by the Preview marquee. Redrawing of the histogram is fast, so that the marquee can be dragged across the image to check the histogram in different parts of the image. The histogram is calculated to 10-bit resolution (1024 bins). You need to resize the Histogram window to at least 1024 pixels width to see each individual bin.

Below the histogram, the average code value for each color channel is shown (see the line labeled 'Mean' in the screen shot above). This average is calculated from the histogram data, so it is not mathematically exact, but ideal for assessing image quality. Average values are shown in the resolution selected in the Pixel Info panel (8-bit, 10-bit, or 16-bit).

At the bottom of the Histogram window, there are a number of buttons that affect the display of the histogram:



Shows/hides the histogram of the sum of all color channels.



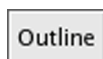
Displays the histogram of the individual color channels (R, G, B).



Displays the histogram of all three color channels with a single click.



Scales the histograms so that the largest peak still fits into the display. This is often not desired since the height of a single narrow peak is not very significant. If the button is not active, histograms are scaled so that the density areas that contain the most pixels can be judged accurately.



Displays the histograms as outlines instead of as filled areas.

3.2.6.2 Line Profiles

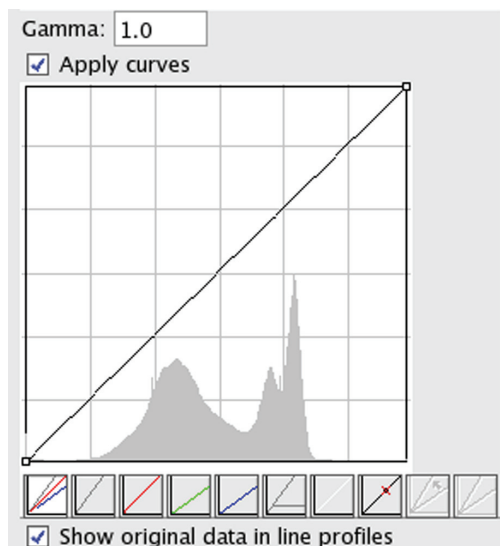


The line profiles show intensity profiles in horizontal (x) and vertical (y) direction. The x and y profiles can be switched on and off separately by the **X** and **Y** buttons of the *Pixel Info Panel* (page 74) or through the viewer's context menu. A typical x profile is shown above.

When a profile is selected, the corresponding profile window opens at the top (for x profiles) or at the right (for y profiles) of the display area. The profile window shows separate profiles for each color channel. The line along which the profile is calculated is shown in the display area. This line can be dragged to a new location with the mouse. You can drag the handle at the bottom (x profile) or left (y profile) of the profile window to change the size of the window.

Depending on the zoom setting and the visible section of the image, the profile line may not be visible in the display area. You can look for the line by scrolling around the image, or you can select **Center profile in viewer** from the context menu, or press Ctrl + Alt + 'L' (for more keyboard shortcuts go to *Keyboard Shortcuts* (page 157)) to move the line to the center of the displayed area.

3.2.6.3 Levels and Curves Controls



With the levels and curves controls, you change the contrast of the displayed image (not the images saved to disk). They combine the functionality of the color curve and level controls in other image processing software. There are two main controls:

- In the large graphical control area, the color curves for each color channel can be manipulated. The horizontal and vertical axes correspond to the input and output ranges of color values respectively. The input RGB histogram is shown in the background, using the same horizontal axis as the curves. Click anywhere in a curve to add a spline point. Drag a spline point to modify the curve. The curve controls can be used to enhance the contrast of the image when checking the image quality. The color curves are active if the **Apply curves** box is checked.

- The level control consists of two triangles at the bottom of the curves control area. The horizontal distance between the triangles defines the input range of color values that is mapped to the full output range. If the triangles are moved closer together, a smaller range of input values is spread across the output range. The level control can be used to equalize the histogram of the displayed image by moving the black triangle to the point where the histogram begins to show values on the left side, and the white triangle to the point where the histogram falls off on the right. Histogram equalization can be used to assess the tonal range of an image. The level control is active if the **Tonal exp.** check box is activated.



Displays all color curves simultaneously. Editing is disabled.



Displays the common curve for editing all color channels. This curve is applied on top of the individual color curves.



Displays the curve for editing the red color channels. All other curves are hidden.



Displays the curve for editing the green color channel. All other curves are hidden.



Displays the curve for editing the blue color channel. All other curves are hidden.



Displays the curve for editing the infrared channel. All other curves are hidden. Defect channel must be activated.



Resets all curves.



Removes the last spline point.



Undoes the last edit.



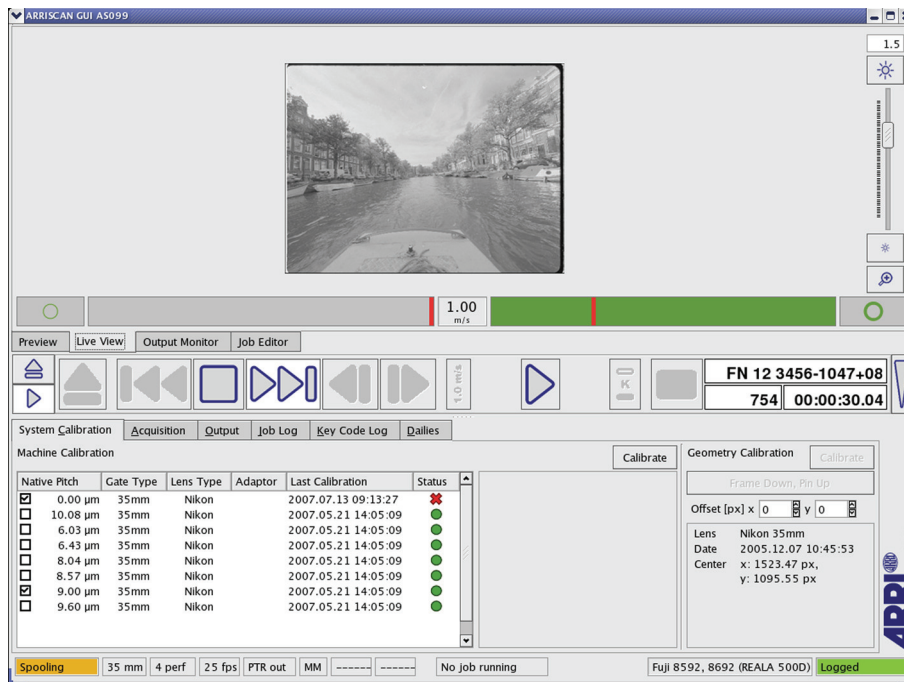
Redoes the last edit.

On top of the curve and level controls, a gamma curve can be applied to the image. The gamma factor is set in the input box above the graphical control area.

The horizontal and vertical profile lines normally show profiles across the input image before the levels and curves controls are applied. To see profiles across the output image, activate the **Show original data in line profiles** check box.

Images that are saved during job processing are not affected by the levels and curves controls. However, you can save the displayed image with the **Save view...** option in the Preview's context menu. Images saved in this way reflect the levels and curves control settings.

3.3 Live View (DD only)



The Live View provides you with a monochromatic real-time film image while spooling. There is a large preview area on the left and a control area on the right.

In conjunction with the *Jog Shuttle (Digital Dailies Option)* (page 85) (available as additional hardware), you can position the film quickly and accurately from your remote PC.

3.3.1 Live View Area

The large display area on the left shows a live view of the image during shuttling. The live view image is updated with a frame rate up to 10 frames per second.

There are a number of *keyboard shortcuts* (page 157) to navigate easily through the reel.

3.3.2 Live View Controls

On the right side of the Live View area, there are controls for the brightness and zoom factor of the Live View.

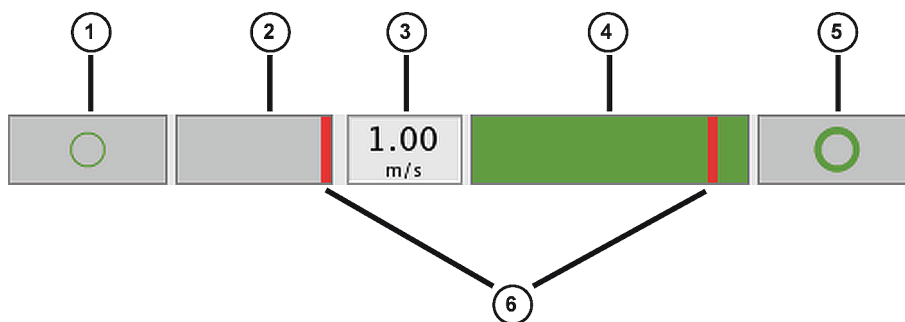
Brightness

You can adjust the brightness of the Live View to make it easier to see details such as writing on a slate. The brightness controls simultaneously affect brightness and contrast of the image. Brightness can be changed by using the slider or the  and  buttons. You can also change the brightness by holding the ALT key and turning the jog dial of the *Jog Shuttle (Digital Dailies Option)* (page 85).

Zoom Factor

The  button toggles the size of the Live View image between fitting the full frame into the view area and filling the width of the view area. If you fill the view area, the image is larger, but the top and bottom of the frame are cut off. In this case, the image can be adjusted vertically with a scroll bar. The vertical position is remembered when the image is toggled back to show the full frame. You can also toggle quickly with button 1 of the *Jog Shuttle (Digital Dailies Option)* (page 85).

Film Transport Information



Below the live view area is the Film Transport Information bar which gives feedback about the status of the film transport during shuttling. This is provided because usually the scanner is operated from a separate room where the scanner cannot be seen. Therefore it is difficult to judge how fast the film is moving and how much film is left on the reels.

The circles at the outer left and right of the information bar (labeled 1 and 5 in the image above) visualize the diameters of the feed and take-up reels, respectively. The film is drawn in green, and the circle in the center represents the film core. When only very little film is left on a reel, the film transport goes into end-of-reel mode, and the film core circle is displayed in yellow.

Next to the reel status indicators are the film speed meters (labeled 2 and 4). These give a visual feedback on the speed of the film transport. A green bar extends to the right on the meter on the right hand side when the film is moving forward. The length of the bar is proportional to the speed. The bar reaches its full length at the maximum speed selected in the *Film Transport Controls* (page 109). Likewise, the bar on the left hand side extends to the left when the film is moving in reverse direction.

The green bar in the film speed meters shows the actual speed of the film. There is also a red line (labeled 6) indicating the target speed selected by the operator. For example, if you press the fast forward button in the Film Transport Controls (or hit 'L' on the keyboard), the red line goes all the way to the right, indicating that the scanner should shuttle as fast as possible. However, when the shuttle wheel on the *Jog Shuttle control* (page 85) is used to shuttle the scanner, the shuttle speed is determined by how far the shuttle wheel is turned. The position of the red line is therefore controlled by the shuttle wheel, and the green bar will never go beyond the red line.

When stopping the scanner, the red line goes back to the center immediately, with the green bar following slowly because it takes a while to stop the film, especially when going at high speeds. You will find that the film speed meters give a very good feedback on the delay in the response of the film transport.

The current target speed is also displayed numerically in the center of the Film Transport Information bar.

3.3.3 Jog Shuttle (DD only)

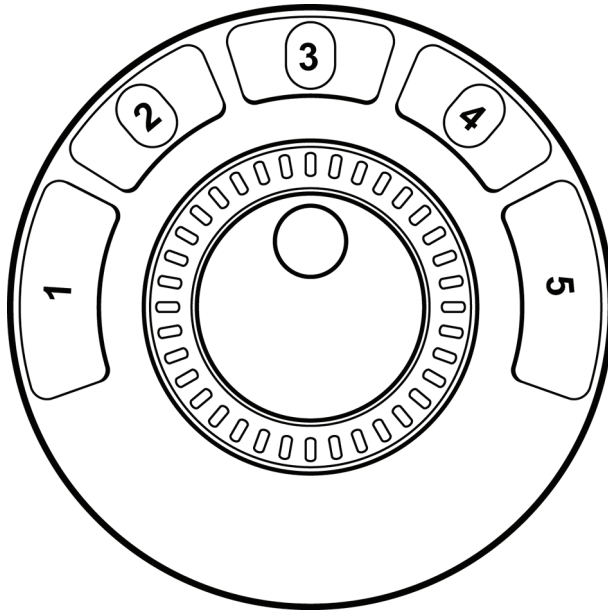


Figure 16: Jog Shuttle

The Digital Dailies Package includes a jog shuttle device for controlling the scanner's film transport. The jog shuttle makes it easier to find positions on the film when watching the live view during shuttling.

The jog shuttle device consists of a number of buttons, a shuttle wheel, and a jog dial. The shuttle wheel (the outer ring in the center of the device) will shuttle the film left and right. The transport speed is proportional to the amount of twist of the shuttle wheel. The maximum speed is given by what is set in the film transport control strip. The shuttle wheel will automatically return to its center position and stop the film transport when you release it. It is intended for shuttling backwards and forwards when you are near the position you want to locate.

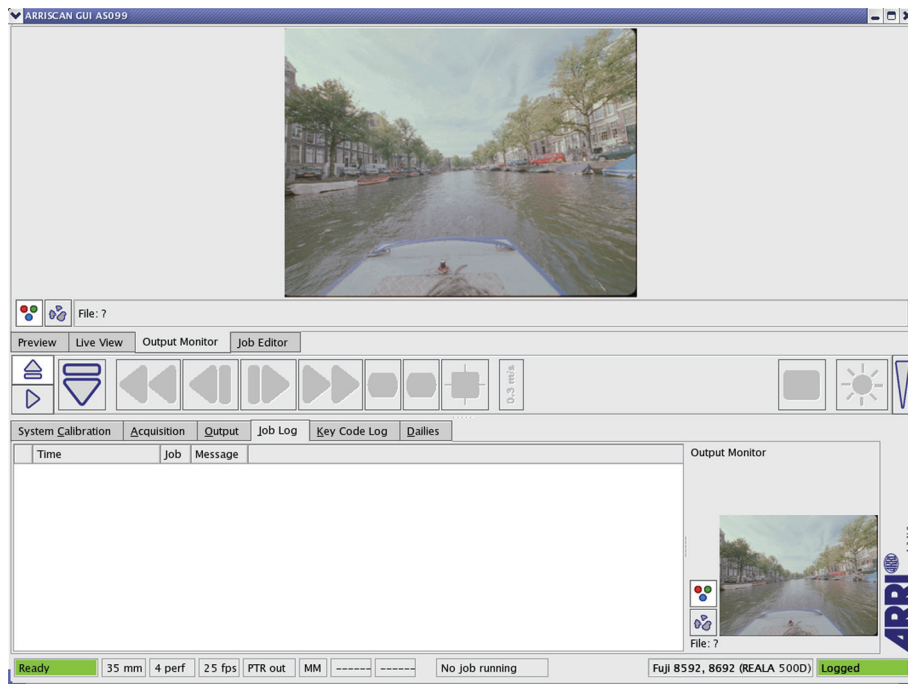
The jog dial (the inner circle of the device) simply steps the film one frame left or right when turned. It is used to locate an exact frame position after the approximate position was found using the shuttle wheel.

The five buttons are used to control permanent winding and the live view display. The three central buttons (2, 3, 4) control shuttling. Of these three, buttons 2 and 4 control continuous forward and reverse spooling respectively. When the scanner is stopped and button 4 is pressed, the scanner starts going forward slowly. Each time button 4 is pressed again, the speed increases. If button 2 is pressed while the scanner is going forward, the scanner slows down with each button press until it stops. Likewise, if button 2 is pressed when the scanner is stopped, it starts going slowly in reverse direction.

Button 3 stops the scanner and then goes back to the frame position where the button was pressed. This is intended to find a position by watching the live image during shuttling. For example, if you want to shuttle to the next slate, start shuttling forward by clicking button 4 on the shuttle wheel a couple of times. Then have your finger ready on button 3. When you see the slate, hit button 3. The scanner stops, then reverses to a position near the frame where you hit button 3. You can now use the shuttle wheel to find the exact position of the slate.

Button 1 toggles the zoom of the live image between fitting the whole frame into the live view tab and filling the width of the tab. Button 5 shows or hides the bottom panel. Therefore, buttons 1 and 5 control the size of the live view. In addition, you can modify the brightness of the live view by holding the ALT key on the keyboard and turning the jog dial.

3.4 Output Monitor



The Output Monitor provides you with an image of the last frame that was saved during job processing.

The resolution of the image is limited by the daemon to ensure that the scanning speed is not affected by the size of the output monitor area. Therefore, the image appears pixelated at large sizes. You may also note color banding. Also note that for performance reasons not every frame that is saved is shown.

You can view the images either in RGB-mode or you can change to the defect channel that is generated by DICE:



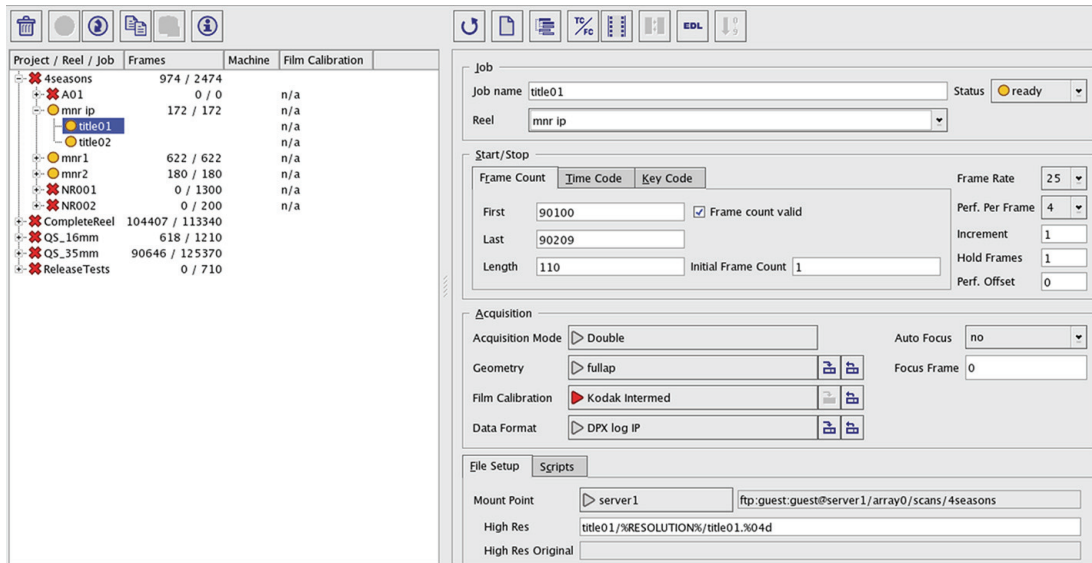
Displays the image in RGB mode.



Displays the defect channel if DICE is available.

The Output Monitor is displayed in a large display area by the corresponding tab in the upper tab area and in a smaller display area on the Job Log tab.

3.5 Job Editor



The ARRISCAN Job Editor is a tool for managing scan jobs. It is used to set up and organize jobs and to set or modify job parameters. Additionally, in the Job Editor you get an overview over the job processing status. It consists of the *Project Browser* (page 89) on the left and the *View Area* (page 90) on the right.

3.5.1 Project Browser

The area on the left side of the Job Editor is the Project Browser. As explained in *Projects, Reels, Jobs* (page 44), jobs are organized into *projects* and *reels* in the database. The Project Browser shows the structure of the job database as a hierarchical browsable tree, very similar to the way a directory structure is displayed in the 'Folders' view of the Windows Explorer.

When the Project Browser is first opened, only projects are visible because they reside at the topmost level. A project is opened (or the tree is expanded) by double-clicking on a project name or by clicking on the + icon to the left of the name. When a project is expanded, its reels are displayed below its name. Similarly, each reel can be expanded to reveal the jobs that belong to it. You can collapse a project or a reel by double-clicking the name again, or by clicking the - icon on the left of the name.

To the right of the project tree, additional information is displayed in three columns:

Frames	There are two figures in this column: the first figure is the number of frames that are selected for processing inside this reel or project (that is, the sum of the frame count of all jobs whose status is 'ready'). The second figure is the total number of frames in all jobs inside the reel or project.
Machine	This column displays the serial number of the scanner that is currently processing this job, if any. This information is particularly interesting in an environment where multiple scanners are running in parallel.
Film Calibration	Indicates, if the selected film calibration is available on the job processing ARRISCAN.

At the top of the Project Browser, there is a toolbar with six buttons:



Deletes the currently selected project, reel, or job. If a project is deleted, all reels contained in it are also deleted. Likewise, if a reel is deleted, all of its jobs are deleted as well.



Moves the selected job up in the list. Jobs are processed in the order in which they appear in the list.



Moves the selected job down in the list, so that it is processed later.



Copies the selected job to the clipboard.



Pastes a job from the clipboard into the reel currently selected.



Displays job processing information about the selected elements in the Project Browser. This button works with jobs, reels, and projects, both in single- and multi-edit mode. For more details see the *Job Info Browser* (page 103).

3.5.2 View Area

The View Area is the area on the right of the Job Editor. It shows either the *Table View* (page 92) or the *Edit View* (page 93). At the top of the View Area, there is a toolbar with eight buttons:



Synchronizes the Job Editor with the database. If changes are made to the database from outside the ARRISCAN GUI, they are not automatically reflected in the GUI. Pressing the button reloads the job data from the database.



Opens a dialog for creating a new job.



Switches the multi-edit mode on/off. In multi-edit mode, you can select multiple jobs or reels in the Project Browser and change the settings of all selected jobs at the same time. See *Multi-Edit Mode* (page 101) below.



Switches the linking of time code and frame count on/off. If this button is pressed (linking is on), the fields 'TC in' and 'TC out' are automatically calculated from the fields 'First Frame' and 'Last Frame', and vice versa. This is the desired behavior in most cases. You can unlink time code from frame count if you need to enter inconsistent time code data, for instance to handle erroneous EDLs.



Switches between displaying the key codes with perforation offset or frame offset. This not only affects the Job Editor but also the key code display in the film transport strip, see *Keycode* (page 112).



Opens a dialog for customizing the columns in the Table View. For more information, see *Customizing the Table View* (page 92).

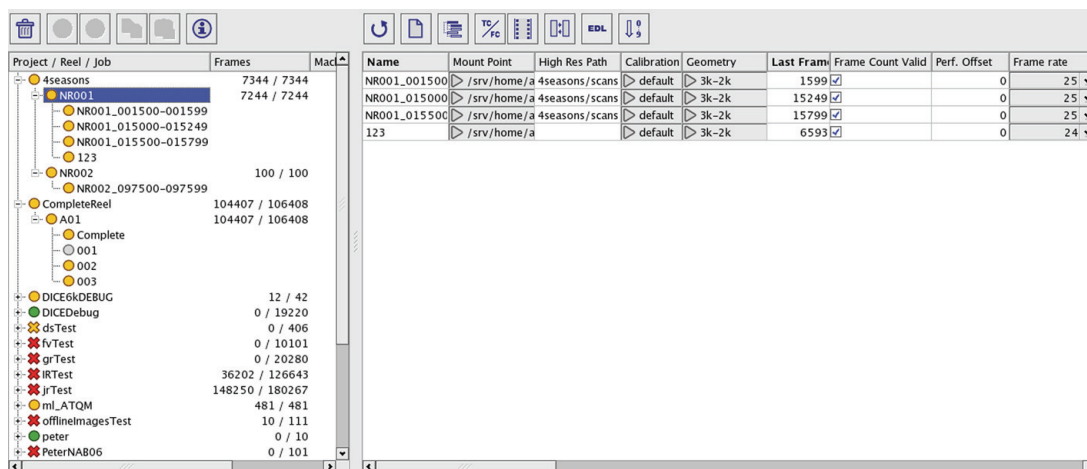


Opens a dialog for importing an EDL. For more information, see *EDL Import* (page 105).



Sorts the jobs by start frame, so that there is no needless spooling. Available only, if a reel is selected.

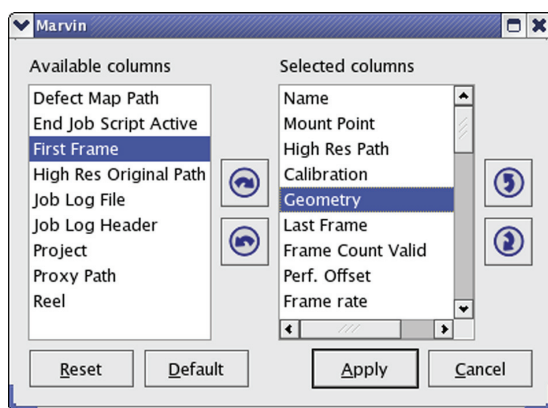
3.5.2.1 Table View



Name	Mount Point	High Res Path	Calibration	Geometry	Last Frame	Frame Count Valid	Perf. Offset	Frame rate
NR001_001500	/srv/home/a	4seasons/scans	default	3k-2k	1599	☒	0	25
NR001_015000	/srv/home/a	4seasons/scans	default	3k-2k	15249	☒	0	25
NR001_015500	/srv/home/a	4seasons/scans	default	3k-2k	15799	☒	0	25
123	/srv/home/a		default	3k-2k	6593	☒	0	24

Selecting a reel in the Project Browser opens the Table View of the Job Editor. In the Table View, all jobs and their corresponding job settings are displayed as table cells and can be modified.

Customizing the Table View



Since there are so many job parameters, it is not possible to see all of them in the Table View without scrolling. You can avoid this by customizing the Table View so that the most important parameters are always visible.

To customize the Table View, in the View Areas's toolbar, click . A dialog for customizing the Table View opens.

In this dialog, you select the columns visible in the Table View and the order in which they are displayed. On the left, there is a list of available columns that are currently not shown in the Table View. The list on the right shows columns that are shown in the Table View. Move columns from one list to the other with the arrow buttons between the lists. The first entry in the right list is the leftmost column in the Table View. Change the order of the columns with the up/down buttons on the right.

The Job Editor automatically saves the Table View customization and restores it the next time the application is started.

3.5.2.2 Edit View

The screenshot shows the 'Edit View' dialog for a job. The 'Job' section at the top contains 'Job name' (Scan_all), 'Reel' (070326), and 'Status' (ready). Below this is the 'Start/Stop' section with three tabs: 'Frame Count', 'Time Code', and 'Key Code'. The 'Frame Count' tab is active, showing fields for 'First' (1500), 'Last' (150369), 'Length' (148870), and 'Initial Frame Count' (1). There are also checkboxes for 'Frame count valid' and 'Perf. Per Frame' (4). The 'Acquisition' section follows, with fields for 'Acquisition Mode' (Double), 'Geometry' (3k-2k), 'Film Calibration' (default), 'Data Format' (tiff16), 'Auto Focus' (no), and 'Focus Frame' (0). The 'File Setup' section at the bottom has two tabs: 'File Setup' and 'Scripts'. The 'File Setup' tab is active, showing fields for 'Mount Point' (/srv/home/arriscan), 'High Res' (Scann_all/scans/070326/%RESOLUTION%/%06d), 'High Res Original', 'Defect Map', 'Proxy' (red shaded), 'Job Log File' (with a browse button), and 'Job Log Header'.

Selecting a job in the Project Browser opens the Edit View of the Job Editor. In the Edit View, the job settings can be modified.

Missing values are indicated by red shaded text boxes (in the screenshot above, the value for 'Proxy' is missing).

Job Settings

The job settings are edited in the View Area using either the *Table View* (page 92) or the *Edit View* (page 93). The available fields are described below. Note that the Table View can be customized to hide some of these parameters.

Job

Job name	Enters the name of the job. Duplicate names are allowed even within the same reel, but are strongly discouraged.
Status	Selects the job status. See <i>Job Status</i> (page 107) below.
Reel	Selects to which reel of the project the job will be added to.

Start/Stop

First	Absolute number of the first frame to be scanned. This number respects the reference frame setting and can be linked to the TC In field as explained above. See also <i>Set Reference Position Dialog</i> (page 115).
Last	Absolute number of the last frame to be scanned. This field can be linked to the TC Out field. Alternatively, the number of frames can be entered in the Length field.
Length	The number of frames to be scanned. Alternatively, the last frame position can be entered in the Last Frame field.
Initial Frame Count	Initial count used for frame numbering in the output file name.
Frame count valid	If this check box is deactivated, there is no valid frame count and the job can only be scanned by key code.
TC In	Time code of the first frame to be scanned (in-point). Can be linked to the First Frame field.
TC Out	Time code of the last frame to be scanned.
First KC	Key code of the first frame to be scanned. Can be linked to the First Frame field.
Last KC	Key code of the last frame to be scanned.
Frame Rate	The base frame rate for the time code fields (TC In and TC Out). Note that in order to get correct film positioning when using time code, the system's base frame rate that is selected when setting the reference frame must match this value. See also <i>Set Reference Position Dialog</i> (page 115).
Perf. Per Frame	Number of perfs per frame.
Increment	Frame increment between two scanned images. Normally, this is set to 1. A value of 2 skips every other frame. A value of 0 does not transport the film at all.

Hold Frames	Number of scans to be made of each frame. Normally, this value is set to 1. A setting of 2 scans each frame twice (faked slow motion). A setting of 0 does not scan anything, and no files are saved.
Perf. Offset	Perforation offset for this job. This can be used to correct for splice errors where a part is spliced into the reel out-of-rack. Normally, this should be set to 0. A value of 1 would shuttle the film forward by 1 perf at the beginning of the job.

Acquisition

Acquisition Mode (DD only)	Switches between Single and Double Flash Mode. See <i>Single or Double Exposure?</i> (page 25).
Geometry	Opens the Select Output Geometry dialog. In this dialog, you select the output geometry to use in this job. See <i>Geometry Panel</i> (page 124).
Film Calibration	Opens the Select Film Calibration dialog. In this dialog, you select the film calibration to use in this job. See <i>Film Calibration Panel</i> (page 131).
Data Format	Opens the Select Data Format dialog. In this dialog, you select the data format to use in this job. See <i>Data Format Panel</i> (page 137).
Auto Focus	Selects whether to carry out an automatic focusing procedure at the beginning of the job or not.
Focus Frame	Relative frame number where the auto focus is done. This number is <i>not</i> an absolute frame count, but relative to the first frame of the job. If this value is set to 0, the auto focus will occur at the first frame of the job. Even with auto focus switched off, the frame defined in this field will be used to perform alignment (perfo search) at the beginning of the job.

The selected output geometry, film calibration, and data format can be copied back and forth between the Job Editor and the corresponding panels in the lower tab area (**Output Geometry** panel, **Film Calibration** panel, and **Data Format** panel) by clicking the copy buttons next to the fields in the Job Editor:



The setting specified in the job is called up in the corresponding panel in the lower tab area.



Copies the name of the setting that is currently selected in the lower tab area into the job.

If either the **Geometry** and **Film Calibration** fields is empty, the setting was not specified and the job will not execute. In this case, the job status is 'incomplete'. For example, jobs that were created by the EDL importer may have empty settings. In this case, you can use the *Multi-Edit Mode* (page 101) to change the settings of multiple jobs simultaneously.

The **Geometry** and **Film Calibration** fields may also display the text '* Error *'. In this case, the setting that was stored in the job does not exist in the database. The reason for this may be that the setting was deleted or that the job was imported from another scanner.

File Setup

Mount Point The button shows the given name of the currently selected mount point. The field next to it shows the assigned directory.

Click the button to open the **Select a Mount Point** dialog. In this dialog, you select, edit, create, or delete the mount point, that is, the directory where the output files are saved.

For more information, see *Mount Point Selection* (page 98).

The image file directories in the other fields of this section are relative to the mount point directory (except for the Job Log File directory).

High Res Path and file name for the high-resolution files. See the naming conventions below.

High Res Original In case of using DICE defect correction, the path and file name for the original high-resolution files without any DICE applied. See the naming conventions below.

Defect Map Path and file name for the defect map generated by DICE. See the naming conventions below.

Proxy Path and file name for the proxy files. See the naming conventions below.

Job Log File Path and file name for the job log file. The job log stores the information that is displayed in the *Job Log Information Panel* (page 146) while executing a job. Note that data is added to the specified log file everytime a job is executed. Click the  button on the right to select an existing log file.

The log file specification uses an absolute path, that is, it takes no notice of the mount point.

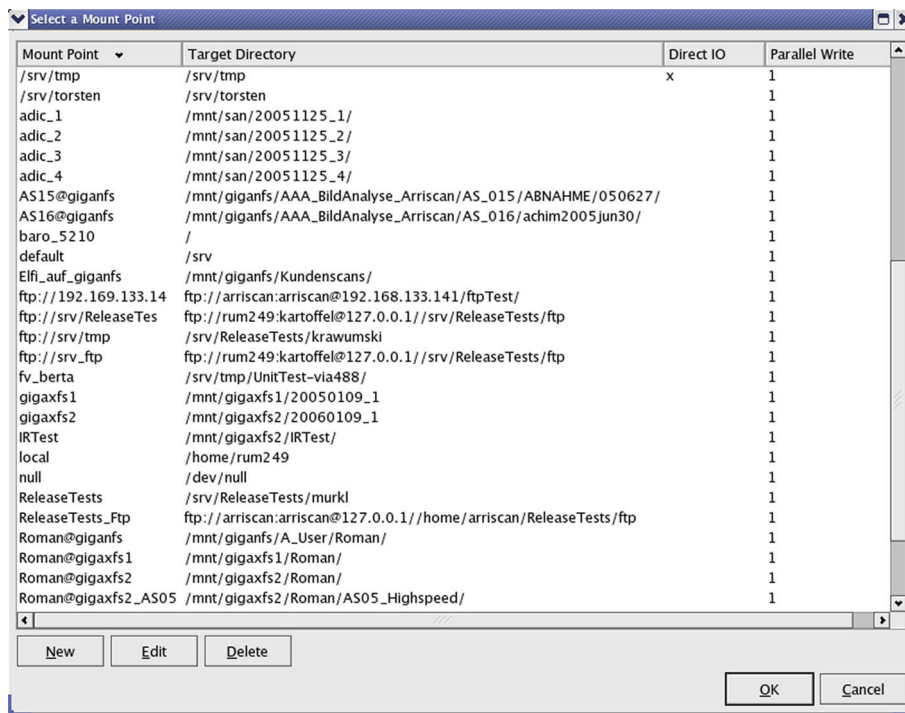
Job Log Header Defines the first line of text of the log file.

Naming Conventions

Image file paths are specified as directory names concatenated with slashes ('/'). The text after the last slash in the path is treated as the file name. You can also use special character sequences (also called variables) as part of the path specification. These are resolved during job processing:

<code>%##d</code>	Is replaced with the frame count. In this sequence, the characters '##' stand for a two-digit number. If this number is omitted as in <code>file%d.dpx</code> , the frame count is inserted directly, resulting in file names such as <code>file1.dpx</code> or <code>file292.dpx</code> . If the number is used, it specifies the number of figures that the frame count is padded to with zeros. The first digit must be a zero and the second digit specifies the number of figures. For instance, <code>file%04d.dpx</code> results in file names such as <code>file0001.dpx</code> and <code>file0239.dpx</code> .
<code>%JOBNAME%</code>	Is replaced with the job name.
<code>%RESOLUTION%</code>	Is replaced with the resolution of the high-resolution image in the format ' <code><x>x<y></code> ' (for example <code>2048x1556</code>).
<code>%DATE%</code>	Is replaced with the date of saving.
<code>%TIME%</code>	Is replaced with the time of saving.
<code>%REELNAME%</code>	Is replaced with the name of the reel.
<code>%PROJECTNAME%</code>	Is replaced with the name of the project.

Mount Point Selection



In the **File Setup** tab of the job settings, click the **Mount Point** button to open the mount point selection dialog.

The mount points are stored in a separate database table. You can edit already created mount points, delete mount points, or create a new mount point.

Mount Point Name of the mount point.

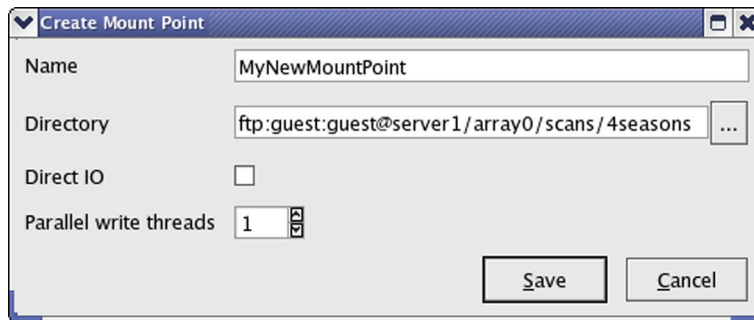
Target Directory The directory of the mount point. This is the base directory for saving the output files.

Direct IO Shows if Direct IO (writing directly on the storage medium) is enabled.

Parallel Write Displays the number of parallel write threads.

The list of mount point settings can be resorted by clicking on any column. Clicking again on the same column changes the sort order.

Creating a Mount Point



The mount point is created in the **Create Mount Point** dialog.

Name	Enter the name of the new mount point. The name can only be edited when a new mount point is being created.
Directory	The mount point directory can be specified as a local directory or as an FTP URL (see below). You can type in the path directly, or you can browse the file system or FTP server by clicking  .
In this release, you should use this button only when setting a mount point directory on an FTP server. Trying to select a local directory from the remote PC using this button may cause problems.	
Direct IO	Activate this check box to enable the ARRISCAN to write directly on the storage medium bypassing the operating system. This can increase throughput on some file systems (notably on SANs).
Parallel write threads	Select the number of parallel write threads. This can increase throughput on some file systems (notably CIFS).

Mount Point Directory Syntax

The mount point directory specifies the base path for saving a job's output images. The path can be entered as a local directory or as an FTP URL. A local directory has the form

```
/mnt/server/project01
```

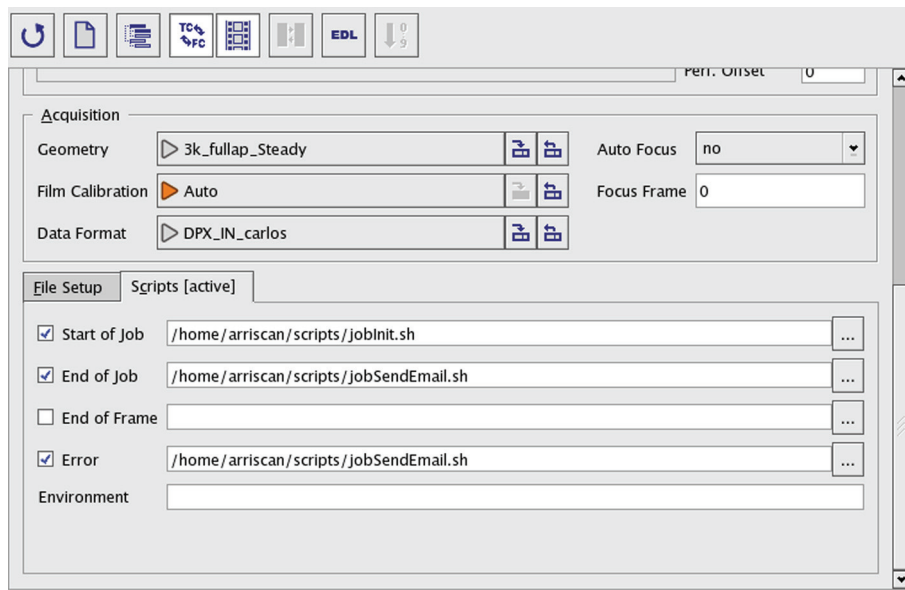
When using a local directory, the files are written to the file system by the operating system. A local directory can be a local drive, a mounted network drive, or a SAN.

The ARRISCAN can also write directly to an FTP server. In this case, the mount point directory is specified in URL syntax:

```
ftp://usr:pwd@ftp.server.com/project01
```

In the example above, replace `usr` with the user name and `pwd` with the password if required. Otherwise, both can be omitted. The ARRISCAN will connect to the FTP server once at the beginning of the job. Parallel writing is supported.

Specifying Job Scripts



Job scripts can be used to execute additional tasks at various points during job processing. This is explained in detail in *Job Scripts* (page 166). Job scripts are specified on the **Scripts** tab next to the **File Setup** tab, as shown above. For each script that you want to activate you need to specify the full path to the script (the mount point is not applied here). The script must also be activated by checking the corresponding check box on the left. These check boxes allow you to activate or deactivate scripts without the need to re-enter the script path every time.

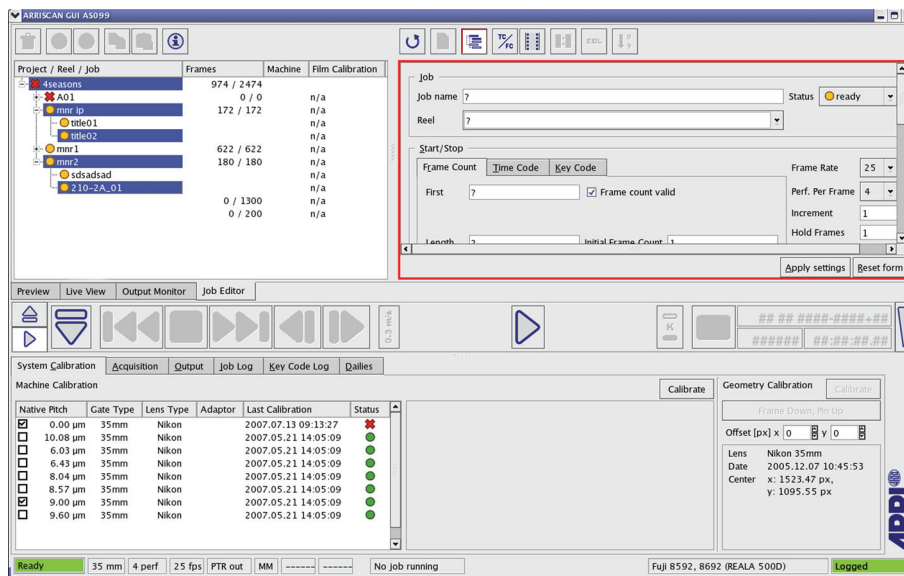
The **Environment** field allows you to set user-defined environment variables that can be used by the job scripts. Environment variables are specified in a semicolon-separated list such as

```
USERONE=1; USERTWO=this is text
```

As in the example above, the last semicolon may be omitted.

If any scripts are active, the label of the **Scripts** tab also displays the tag **[active]** (as shown in the screenshot above). This indicates that scripts are used by the job when the **File Setup** tab is shown instead of the **Scripts** tab.

3.5.2.3 Multi-Edit Mode



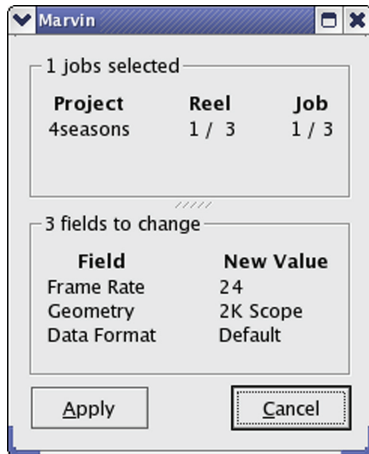
The Job Editor allows you to edit the settings of multiple jobs simultaneously. To do this, click the  button to switch to multi-edit mode. You can now click on projects, reels, and jobs in the Project Browser to select or deselect them. If a reel or project is selected, all containing elements are selected.

In multi-edit mode, the View Area displays the *Edit View* (page 93) with two buttons at the bottom: **Apply Settings** and **Reset Form**. If all selected jobs have a setting in common, this common value is shown for that setting. All other settings are displayed as a question mark.

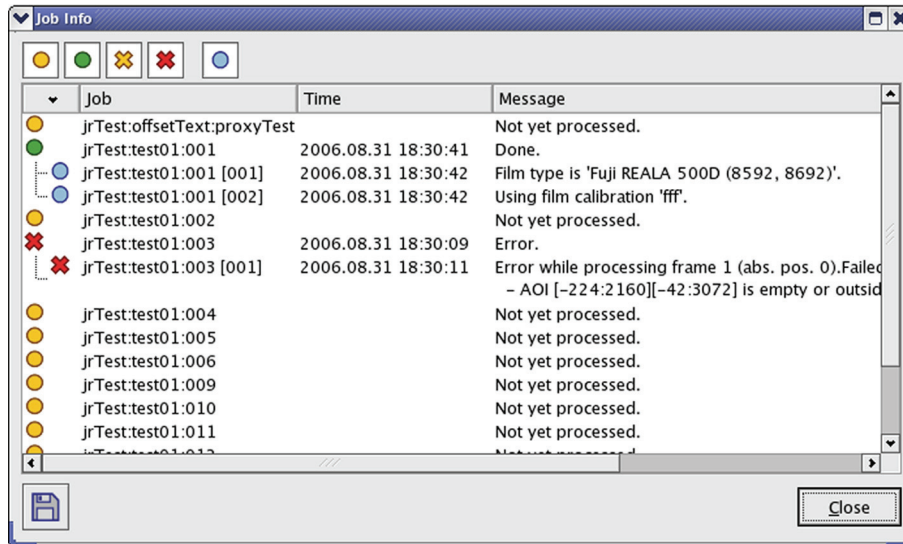
After you have selected all the jobs that you want to modify, you can change the settings that you want all jobs to have in common. Only these settings will be changed in the selected jobs. The settings that are displayed as '?' will not be touched. If you accidentally change the wrong setting, you can change the setting back to '?'. You can also exit the multi-edit mode without applying the changes or you can start over again. To do so, click the **Reset Form** button at the bottom of the edit form.

When you are finished with your modifications, click the **Apply Settings** button. A dialog appears with an overview of the changes that will be applied. The top of the dialog gives a summary of the selected jobs. The bottom of the dialog shows a list of the fields that will be changed along with their new values. When you click **Apply**, the selected jobs are modified.

In order not to accidentally change jobs already scanned (and subsequently switch them from successful to ready), the multi-edit function does not normally change jobs that are labeled **successful**. To overwrite this safety feature, activate the **change successfully scanned jobs** option.



3.5.3 The Job Info Browser



The Job Info Browser is a tool for checking the results of a job processing operation. It can be opened with the **Info** button in the Job Editor's *Project Browser* (page 89).

During job processing, some log messages are stored into the database record of the job being processed. These messages include errors and warnings, but also additional information such as the film type encountered and the calibration used (if the job uses automatic film calibration selection). These messages also appear in the *Job Log* (page 146). However, they are difficult to find there because the Job Log also contains messages for every single frame that was processed. In addition, the Job Log in the **Job Log** tab only shows the last 500 messages. If a job log file was specified in the job, the messages are also saved into this file, but the file cannot be accessed from the ARRISCAN GUI. The Job Info Browser provides a convenient way to view this information.

If a single job is selected in the Job Editor's Project Browser when the **Info** button is clicked, a dialog shows the job info for that job. This information includes the job messages and the number of frames that were scanned before the job was stopped (in case an error occurred or processing was aborted).

When a reel or project is selected and the **Info** button is clicked, the Job Info Browser opens. It contains a summary of all jobs in the reel or project. Using the toolbar at the top of the window, you can filter the information to be displayed:



Switches the display of jobs that have not been processed on/off.



Switches the display of jobs that have been successfully processed on/off.



Switches the display of warnings on/off. This includes warning messages within jobs, as well as entire jobs with warning status (such as aborted jobs).



Switches the display of errors on/off.



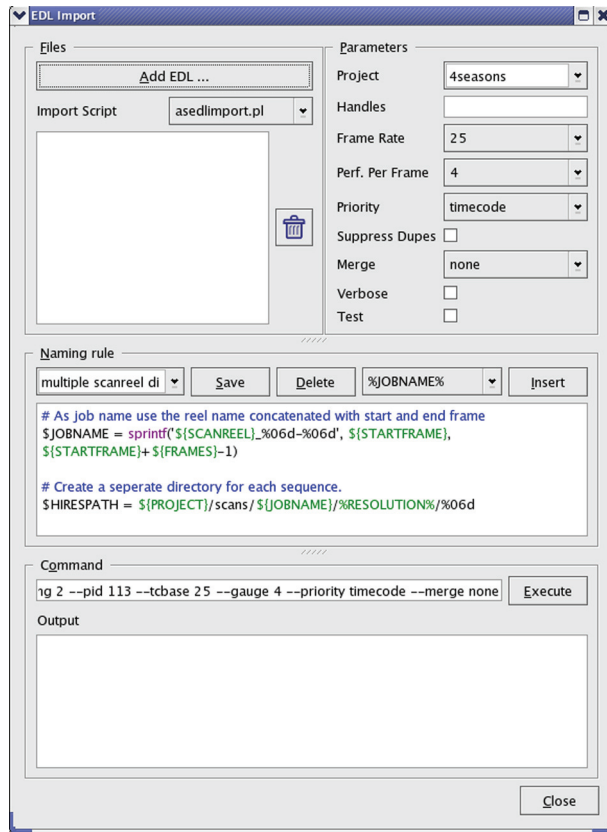
Switches the display of normal messages on/off.

If a job is not displayed due to the filter button settings, no messages that belong to this job will appear in the browser. Note that jobs that have been scanned successfully may contain warning messages. These are hidden if warning messages are filtered out. In general, you should be careful about filtering out messages because it may result in problems being missed.

Using the filter buttons, you can get a quick overview of the job processing status. Applications include:

- Checking for jobs where no film calibration had been found (show errors; all other buttons off). When automatic film calibration is selected and no matching calibration is found during processing, the job is set to error status, but processing continues with the next job. In the Job Info Browser, you can immediately see which film type was encountered at the skipped jobs and create the missing calibrations quickly.
- Checking which film calibrations were used when scanning with automatic calibration selection (show successful jobs and messages only).
- Checking which jobs were not processed after processing a reel in key-code based mode (show unprocessed jobs; all other buttons off). When scanning by key code, it is not guaranteed that all jobs are processed since only those jobs will be scanned that are actually found on the reel.
- Checking when the jobs in a project or reel were scanned (show processed jobs; all other buttons off).

3.5.4 EDL Import



The ARRISCAN software includes a comprehensive set of scripts for importing job definitions into its database with the astools Package. Virtually all editing systems can export EDL files in the CMX 3600 format. The ARRISCAN GUI provides a graphical user interface for the scripts that create ARRISCAN jobs from events in EDL files. This is accessible through the  button in the Job Editor, which opens the **EDL Import** dialog shown above.

Files

The files to be imported are specified in the 'Files' section.

- Add EDL** Opens a file selection dialog for adding files to the import list.
- Import Script** Selects the script used for parsing the imported files. Use 'asedlimport.pl' for CMX 3600 style EDL files and 'astabbedimport.pl' for importing text files. For more details see *asedlimport.pl* (page 226) and *astabbedimport.pl* (page 223).



Clears the import list.

Parameters

This section defines the parameters used for importing the EDL files.

Project	Selects the name of the project the new jobs will be added to. You can select an existing project or enter a new name.
Handles	Enters the number of additional frames to scan before and after each event in the EDL.
Frame Rate	Selects the base frame rate for the time code information in the EDL.
Perf. Per Frame	Selects the number of perfs per frame. It is mandatory that the correct Perf Per Frame is specified. Otherwise, key code based calculations may yield the wrong results. If jobs have been imported with the wrong Perf Per Frame setting, they should be imported again with the correct setting to ensure that all values are recalculated.
Priority	Defines how EDLs containing time code and key code should be handled. For more information refer to <i>Options for Import Filters</i> (page 184).
Suppress Dupes	If this check box is activated, the importer will ignore events whose frames are included in jobs which already exist in the database.
Merge	Selects the merging option. Use the 'list' option to merge overlapping clips in the scan list(s) into one job. Use the 'db' option to extend the merging of new clips to existing jobs that have not yet been executed.
Verbose	Shows additional information during import.
Test	If this check box is activated, the files will be parsed, but no jobs will be created in the database. Use this mode to check if there are any problems with the EDL files.

Naming Rules

The naming rules define how fields in the job definition not directly retrievable from the EDL (as directory structures for the image files) are constructed from the imported event data. The syntax for these rules is documented in *Name Processing* (page 179). The **EDL Import** dialog allows you to store these rules as settings.

Rule definitions can be entered directly into the text box under **Naming rule**. Lines that start with a '#' are treated as comments. Above the text box on the left there is a combo box from which previously saved naming rules can be selected. To create a new setting for the current rule, enter the name into the box and click **Save**. To delete the current rule setting, click **Delete**.

To the right of the **Delete** button, there is another list with names of predefined variables. Select a variable and click **Insert** to place the corresponding text into the text box at the current cursor position. The variables for CMX 3600-style EDLs are documented in *asedlimport.pl* (page 226). For tab-separated files, the variables are determined by the column headers; see *astabbedimport.pl* (page 223) for details.

Command

As parameters are set and modified, the command line for executing the import script is assembled in the dialog's 'Command' section. When all parameters are set, click **Execute** to run the script. The script's messages are displayed in the 'Output' area at the bottom of the dialog. If the script encounters any problems during the import, it writes error messages into this area.

You can select the command line that is built by the GUI and paste it into a shell window or another script.

3.5.5 Job Status

The concept of job status is central to the ARRISCAN's management of job processing. A job's status may have any of the following values:

	skip	User setting	Job will be ignored during job processing.
	ready	User setting	Job will be processed.
	success	System only	Job has been processed successfully.
	stopped	System only	The processing of this job was interrupted by the user.
	error	System only	An error occurred during processing of this job.
	incomplete	System only	Indicates that settings are missing. Set by the system when importing job definitions from files as EDLs.
	running	System only	This job is currently being processed.

Even though the job status is a parameter that can be changed by the user, only the two values labeled as user settings in this list can actually be selected. The other values are set by the system during job processing or when jobs are imported from files. If a job status selection box shows a value that is not a user setting, the user can reset this value to either 'skip' or 'ready'.

A job can only be modified if its status is either 'skip' or 'ready'. This ensures that a job that has been processed (whether successfully or not) will always show the settings used for processing.

3.6 Film Transport Controls

The film transport strip in the center of the main application window is the central control element of the scanner. It is used to

- load and unload the film
- set the reference position
- shuttle to specific positions
- start job processing.

The buttons in the strip are large to make them easy to use on the ARRISCAN's touch screen.

3.6.1 Film Transport Modes

The film transport strip has two modes, which differ in the configuration of the controls that are available in the strip. The two small buttons on the left edge of the strip are used to switch between modes.



Selects the film load mode. In this mode, the film transport strip shows controls for loading and unloading the film and finding and setting the reference frame.



Selects the operation mode. In this mode, the transport strip shows controls for shuttling to a specific position, for setting film transport parameters, and for starting job processing. It also shows the film position display and the button for switching the key code reader (35mm only).

The film transport strip automatically switches from load to operation mode after the reference frame has been set. It also switches from operation mode back to load mode when the film is unloaded.

3.6.2 Buttons for Setting Up the Scanner



Loads/unloads the film. Depending on whether the film is loaded or not, this button opens the *film transport setup dialog* (page 113) or the *unload film* (page 114) dialog.



Shuttles the film temporarily in reverse/forward direction. The film transport is activated while the button is pressed and stops when the button is released.



Steps one frame backwards/forward.



Steps one perf backwards/forward. Used to align the frame in the gate.



Executes a perforation search to properly (re)align the perforation holes to the pins, for example after winding across a splice. This is also automatically done when loading the film and at the beginning of each job.



Sets the shuttle speed. Options are 0.3 and 1 m/s. For 35 mm film, 2 m/s is also available.



Opens the *set reference point dialog* (page 115). In this dialog, you set the reference position at the current frame.



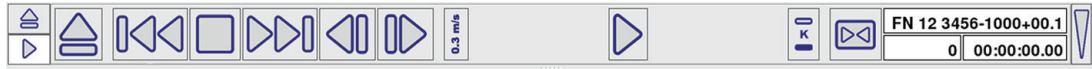
Switches the illumination to permanent low-power white light illumination. In this mode, the frame in the gate is easy to see when locating the reference frame (punch frame). The illumination does not damage the film and will switch off automatically when the control strip is switched to operation mode.



Enlarges the Preview's display area and hides the lower tab area. Click the button again to undo the enlargement.

For more information, see *Touch Screen Support* (page 71).

3.6.3 Buttons for Operating the Scanner



Buttons that were already explained in the previous section are not listed again here.



Shuttles the film in reverse/forward direction. The film transport keeps shuttling until the stop button is pressed.



Stops the film transport.



Starts the automated job processing. Opens the *job processing start dialog* (page 117) (for selecting a job or a reel for processing).



Sets the key code track to front/rear. This button is available for 35 mm film only. For camera negative that went through the camera in forward direction, the track should be set to front (solid bar at the bottom). If no key codes are detected, the track setting may be wrong.



Locates a specific film position. Opens the *locate position dialog* (page 116).

3.6.4 Film Position Display

FN 12 3456-1004+09.1	
73	00:00:03.01

The film position display shows the current frame position in different units.

Frame Number

The frame number is shown at the bottom left of the position display. The frame number is counted from the reference position. The reference can be set to any number at any frame on the reel with the **Set** button (available in the load configuration of the film transport strip).

Time Code

The time code is shown at the bottom right of the film position display. In the ARRISCAN, the time code is directly linked to the frame number. This means that the time code can always be calculated from the frame number and vice versa. Note that for time codes larger than 1 hour this results in large frame counts.

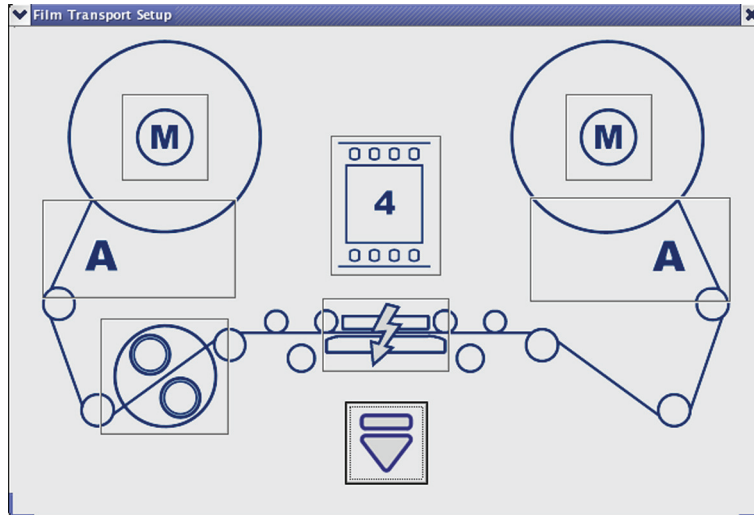
The frame rate for calculating the time code is set in the *dialog for setting the reference position* (page 115). This is the system's base frame rate which is also shown in the *status bar* (page 154) at the bottom of the application window.

Key Code

The current key code is displayed in the top section of the display. The key code can be shown with an offset in perfs or in frames. Clicking the **Perforation Offset** button in the *Job Editor* (page 89) switches between the two modes. In frame offset mode, the figures '.1', '.2', '.3', or '.4' are appended to the key code. These figures denote the perforation (relative to the top of the frame) where the key code mark was detected. This is important when using frame offset mode with 3-perf material. Note that if there is no number separated by a '.' at the end of the key code, the offset is displayed in perfs.

Perf offset mode is less ambiguous than frame offset mode. However, although perf offset is part of the SMPTE definition for the DPX file format, it is currently not widely used.

3.6.5 Film Transport Setup Dialog

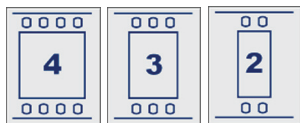


The **Film Transport Setup** dialog appears when the **Load film** button  is pressed in the film transport strip. The dialog is used to set up the scanner's film transport system before the film is actually loaded.

As shown in the screenshot above, the dialog consists of a simplified picture of the ARRISCAN's film transport system. Components whose settings can be changed are buttons that can be clicked to switch the settings.



Size of the film core or bobby. Large size corresponds to 5" diameter (rarely used with 35 mm film), medium size to 3" diameter (standard size for 35 mm film), and small size to 2" diameter.



Vertical size of a frame in perfs.



Particle Transfer Rollers (PTRs) in/out of the film path. After clicking the button, the PTRs are moved into position. Only after the movement is finished the button changes to the 'in' positions.



Wind mode: A wind for outside film path (emulsion inside on the reel), B wind for inside film path (emulsion outside on the reel) as shown in the dialog.



Exit the dialog and load the film.



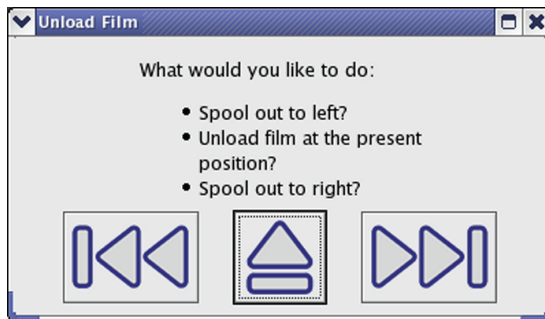
Gate is powered on. This is the normal mode of operation. The gate should not be removed in this state!



Gate is powered off. In this state, the gate can be removed safely!

To exit the dialog without loading the film, simply close the window or press Esc on the keyboard (if available).

3.6.6 Unload Film Dialog



This dialog appears when the **Unload film** button  is clicked in the film transport strip. The dialog offers three choices for unloading the film:



Spools out to the left film platter and unloads the film.



Unloads the film at the present position without spooling.



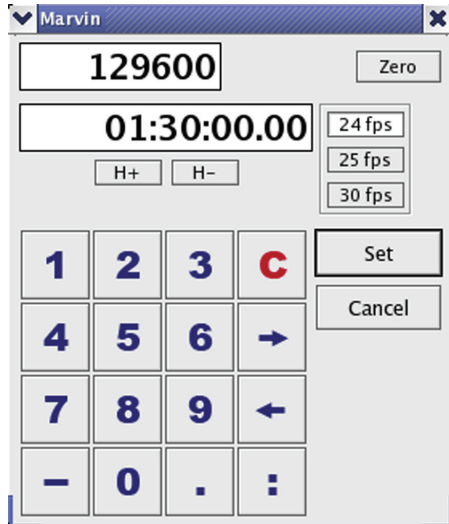
Spools out to the right film platter.

If one of the spool out buttons is selected, another dialog appears that allows to stop the spool out operation at any time. Note that when spooling out, the film end will be pulled through the gate before the film is unloaded.

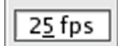
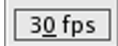
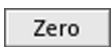
While spooling out, the film transport may slow down and stop near the end of the roll. This is normal; the transport will restart and continue to spool out.

To exit the dialog without unloading the film, close the window or press Esc on the keyboard (if available).

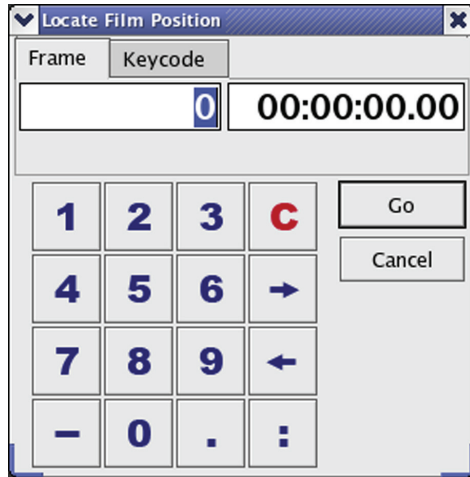
3.6.7 Set Reference Point Dialog



This dialog opens when the **Set**  button is clicked in the film transport strip (only visible in film load mode). The dialog is used to define the frame position at the current frame. The position can be set either as a frame count (upper box) or as a time code. Since the two are linked, the time code will change automatically when a frame count is entered and vice versa. When setting the time code, the frame rate must be specified as well. A keypad is provided at the bottom of the dialog for entering numbers on the ARRISCAN's touch screen.

		Increments/decrements the time code by one hour.
	Sets the frame rate in frames per second.	
		
		
	Sets the frame count and time code to zero.	

3.6.8 Locate Position Dialog

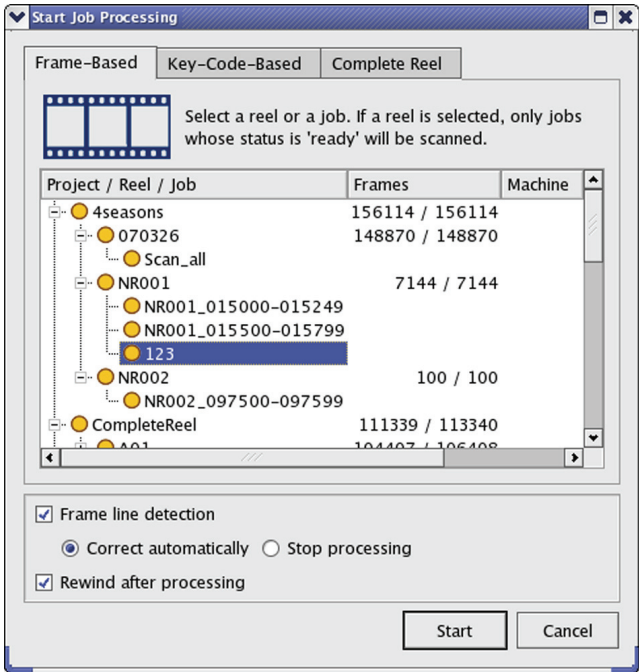


This dialog opens when the **Locate** button  is clicked in the film transport strip. The destination position can be entered as a frame count or as a time code. Click the **Keycode** tab to enter a key code to locate a position.

You can enter the position either by pressing the buttons or directly in the input field. Since time code and frame count are linked, entering the frame number displays the corresponding time code automatically (and vice versa).

On the **Keycode** tab, check the **Keep current frame line** box if there may be incorrect splices or your key code information is not perf-accurate.

3.6.9 Start Job Processing Dialog



The **Start Job Processing** dialog opens when the start job button  is pressed in the film transport strip. There are three job processing modes: **Frame-Based**, **Key-Code-Based**, and **Complete Reel**. These are described in detail below.

Before job processing can start, the job settings must be specified. In Frame-Based and Key-Code-Based modes this is done by selecting jobs or reels to be scanned from a project tree similar to the Job Editor's *Project Browser* (page 89). In Complete Reel mode there are no jobs to be scanned. Instead the job processing setup is specified via reel settings.

The screenshot above shows the project tree with collapsible nodes for projects and reels. Navigate the tree by clicking on items and scrolling the window.

There are three additional columns in the tree view:

Frames	A count of the number of frames in the corresponding project or reel. The first figure is the number of frames that are selected for processing. The second figure is the total number of frames in all jobs.
Machine	The serial number of the machine that is processing this project, reel, or job (if any). If a machine number appears in this column, the corresponding entry cannot be selected for processing.
Film Calibration	Indicates if the selected film calibration is available on the job processing ARRISCAN.

Note that the **Start** button cannot be selected until either a reel, a job, or a reel setting has been highlighted.

Frame-Based Processing

Frame-based job processing is used to scan specific jobs. The starting positions for scanning are specified in frame counts or time code (the two are interchangeable in the ARRISCAN) relative to a reference position such as a punch frame.

Either a reel or a single job must be selected in the Frame-Based tab's project tree before job processing can commence. If a reel is selected all jobs inside the reel whose status is 'ready' will be scanned. If a single job is selected the job is scanned regardless of its status.

When the Job Processing dialog is opened and a job is selected in the Job Editor, this job is automatically preselected in the Frame-Based tab's project browser.

For more details regarding frame-based scanning see *Time Code-Based Workflow* (page 163).

Key-Code-Based Processing

In key-code based processing mode the job's starting positions are specified as key codes. The ARRISCAN shuttles through the reel looking for jobs whose status is set to 'ready' and whose starting key code position matches a key code found on the reel. The range of jobs considered during this search can be limited by selecting a project or reel in the Key-Code-Based tab's project browser. Only jobs whose status is 'ready' will be scanned, but jobs whose starting points are not found on the reel will not be scanned even if set to 'ready'.

It is recommended to always select the entire project instead of a single reel since no jobs would be scanned if the loaded reel does not match the selected reel.

The reason why it is possible to select a single reel for key-code based scanning is that there is a small chance that the same key code can be found on different reels. This is only an issue with 16 mm material, and even then it should be extremely rare to encounter two rolls that have overlapping key codes in the same project. Nevertheless, should this situation ever occur, the project can still be scanned by selecting the reel that was loaded.

Film should always be loaded on the left reel (the feeder plate). This is especially important for key code based scanning, since the film must pass through the key code reader before it reaches the gate.

When processed by key code, jobs will usually be set to use automatic film calibration. Therefore you should make sure that there is a film calibration for all film stocks likely to be encountered. See *Automatic Selection of Film Calibration* (page 172) for details regarding automatic film calibration.

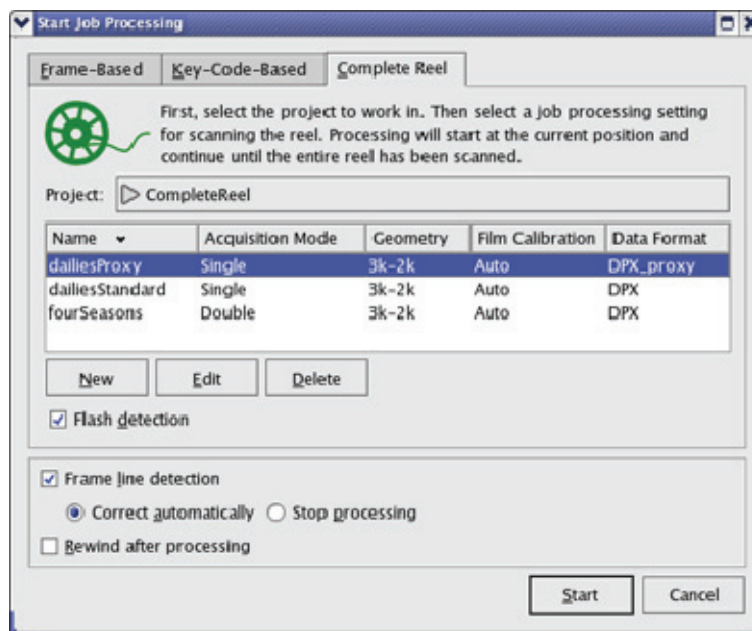
For more details regarding key-code based scanning see *Key Code-Based Workflow* (page 164).

Keep Current Frame Line (DD only)

If the job information that was imported from the editing system contains true perf-accurate positions, they can be used to scan a reel without setting the frame line. Perf-accurate positioning can also be used to scan reels that were spliced incorrectly so that the frame line jumps between splices.

However, if the job information is not perf-accurate, the **Keep current frame line** box should be checked. The current frame line position is then kept even if a key code position does not match the position specified in the job perf-accurately. This can be useful if the key code positions in the jobs are in perf offset format but not actually perf accurate.

Complete Reel Processing



Complete reel processing is used to scan all frames of a reel into a single directory. This is useful when no jobs have been defined for the reel, such as when scanning dailies or for projects where it is desirable to have all material online in full quality, for instance in commercials work.

Since no jobs exist when scanning a complete reel, the job processing setup is defined a **Reel Setting**. A reel setting is similar to a normal job, but does not have a start or end position (among other things). It is stored as a normal job in the database, but it is invisible to the Job Editor.

Reel settings are project specific. In order to select a reel setting in the Complete Reel tab, you must first select a project using the **Project** selector at the top of the tab. After selecting the project, the reel settings defined for the project (if any) are listed in the box below the project selector. This list of settings is similar to those found in *Selection Buttons* (page 69). You can create new settings and edit or delete existing ones using the buttons below the list box. Or simply select the desired setting and click **Start** to commence job processing.

During complete reel processing, the job is automatically restarted when the scanner detects a change of film stock. *Automatic Selection of Film Calibration* (page 172) should be used for complete reel jobs so that the correct calibration is applied when the film stock changes. Even if the job is restarted, the files in the destination directory are always numbered consecutively.

Creating a Reel Setting

The screenshot shows the 'Create Reel Setting' dialog box. It is divided into several sections. The 'Setting' section has a 'Setting name' field with the value 'hqProxy'. The 'Interval' section has 'Increment' and 'Hold Frames' fields, both set to '1'. The 'Acquisition' section has four fields: 'Acquisition Mode' (Single), 'Geometry' (3k-2k), 'Film Calibration' (Automatic selection), and 'Data Format' (DPX_proxy). Below these are two tabs: 'File Setup' and 'Scripts'. The 'File Setup' tab is active, showing fields for 'Mount Point' (scannersan), 'High Res' (%PROJECTNAME%/JOBNAME%/ hires/img%05d), 'High Res Original', 'Defect Map', 'Proxy' (%PROJECTNAME%/JOBNAME%/ proxy/img%05d), 'Job Log File' (with a browse button), and 'Job Log Header'. The 'Scripts' tab is also visible. At the bottom of the dialog are 'Create Setting' and 'Cancel' buttons.

The screenshot above shows the dialog for creating a reel setting. It is similar to the dialog for creating a new job, but it contains only data acquisition settings.

Reel settings are also used by the *Job Setup Panel* (page 152) in the Dailies tab.

Flash Detection (DD only)

If the **Flash detection** check box is activated, the ARRISCAN will detect the beginning of a take due to the overexposure of the film caused by the slow ramping of the starting camera. The information is written into an XML file into the same directory containing your pictures. The flash positions can be used to find individual shots inside a directory of complete reel scans more quickly.

The format of the XML file is described in *The Complete Reel Mode XML File* (page 242).

Rewind After Processing

If the **Rewind after processing** check box is activated, the reel will be rewound after job processing is finished.

Frame Line Detection (DD only)

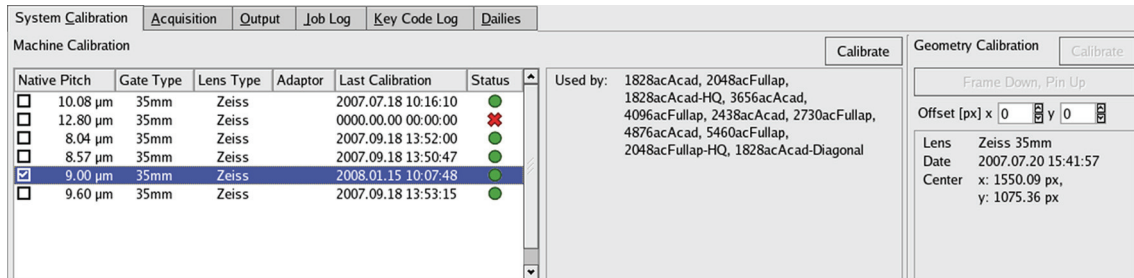
If the **Frame line detection** check box is activated at the bottom of the window, the ARRISCAN will automatically detect and correct splicing errors. You have the choice to let the ARRISCAN correct the offset and keep on scanning or stop the processing.

For the frame line detection to work properly, it is important to use accurate film calibrations. Usually it takes a few scanned frames until the scanner detects a framing misalignment. When selecting **correct automatically**, the scanner will then wind back to the position where the mismatch was detected, realign and continue scanning. When **stop processing** is selected, job processing will quit with an error.

Frame line detection is part of the Digital Dailies Base Package. It is available in all job processing modes.

3.7 System Calibration Panel

The **System Calibration** panel contains the **Machine Calibration** panel and the **Geometry Calibration** panel.



3.7.1 Machine Calibration Panel

The **Machine Calibration** panel is located in the **System Calibration** tab in the lower tab area of the main application window. It is used to initiate a calibration of the camera and illumination and to view the calibration status.

The list on the left shows the calibrations that are available:

Native Pitch	Displays the available pitches. Each <i>native pitch</i> (page 29) requires a separate <i>machine calibration</i> (page 32). The check box on the left selects a pitch for calibration.
Gate Type	Displays the gate type. For each type of gate (35 mm or 16 mm), a separate calibration is required even for the same pitch.
Lens Type	Displays the lens type. Currently Nikon and Zeiss lenses are supported.
Adaptor	Displays whether the 16 mm adaptor has to be fitted or not. The adaptor is used when scanning 16 mm film on the ARRISCAN.
Last Calibration	Displays the date and time of the last calibration for each pitch.
Status	Displays a green circle if the last calibration was successful or a red cross if the last calibration failed. A pitch with a failed calibration is not available for scanning.

The text area on the right shows information about the calibration that is selected in the list. At the top of this area, all geometry settings that use the calibration are listed. When recalibrating, an operator can save time by selecting only calibrations that are required for the job at hand.

The **Calibrate** button on the top right starts the machine calibration process. A complete open-gate calibration is carried out for every selected pitch. During the calibration, a progress window shows status messages on the calibration process. The calibration can be canceled from this window.

The pitch whose calibration was in progress when the **Cancel** button was pressed will not be calibrated and will show a red cross in the status column. This pitch must be recalibrated before it can be used. In addition, if a calibration is canceled, some of the selected pitches may retain their previous calibration.

3.7.2 Geometry Calibration Panel

Geometry Calibration Calibrate

Frame Down, Pin Up

Offset [px] x 0 y 0

Lens Nikon 35mm
 Date 2005.12.07 10:45:53
 Center x: 1523.47 px,
 y: 1095.55 px

The ARRISCAN image geometry is calibrated with a standardized calibration sample consisting of a calibration pattern on a glass plate. This function should normally only be used when hardware on the scanner had been readjusted or replaced.

Calibrate	Starts the calibration.
Frame Down, Pin Up	Sets the film transport to geometry calibration mode. The glass plate can then be placed in the gate without the frame pushing the plate against the top of the gate. This is necessary because the glass plate is too thick for the gate to be fully closed. While the button is pressed, preview scans from the GUI will not change the state of pin and frame in the gate.
Offset	Enters the values to compensate geometry offsets between different scanners in facilities that operate more than one scanner. (A slight geometry offset might be caused by the positioning tolerance of the glass plate.)

3.8 Acquisition Panels

The scanning parameters are set up in the **Acquisition** panels. As described in *Settings Management* (page 42), settings are stored in the database. Each panel corresponds to a database table. Changes in the scanning parameters are directly reflected in the image that is displayed in the viewer. In the job setup, saved scanning parameters are referenced by name.

3.8.1 Geometry Panel

The **Geometry** panel defines the area and resolution of the frame that is scanned. This includes the pitch, the size of the area, and the positioning. These parameters and the geometry handling of the ARRISCAN in general are explained in *Matching Film Frame to Sensor* (page 27). Within that section, there is a diagram explaining the positioning and sizing of the scanned area in *Frame Size* (page 30).

Geometry Selection

Geometry	Sampling	Native Pitch	Gate	Adaptor	Origin [µm]	Size [px]	Proxy Geometry
3k-2k_fullap	3K -> 2K	9.00 µm	35mm	none	1797 x 2514	2048 x 1556	SD PAL 768x576
3k2k	3K -> 2K	9.00 µm	35mm	none	1797 x 2514	2048 x 1556	1K
3k2k_fv3perf	3K -> 2K	9.00 µm	35mm	none	1797 x 2514	2048 x 1576	flo
3k2k_jr3perf	3K -> 2K	9.00 µm	35mm	none	1797 x 2514	2048 x 1173	1K
3k2k_julidreh	3K -> 2K	9.00 µm	35mm	none	1797 x 2514	1024 x 1556	1K
3k2kFV	3K -> 2K	9.00 µm	35mm	none	1797 x 2514	2048 x 1556	flo
3k_8.04u	3K	8.04 µm	35mm	none	1797 x 2514	2730 x 2125	1K
3k_fullap	3K	9.00 µm	35mm	none	1797 x 2514	2792 x 2104	SD PAL 768x576
3k_fullsensor	3K	9.00 µm	35mm	none	1797 x 2514	3072 x 2160	1K
3k_fullsensor_fv	3K	9.00 µm	35mm	none	1797 x 2514	3072 x 2160	1K
3k_fullsensor_nic	3K	9.00 µm	35mm	none	1797 x 2514	3072 x 2160	1K
3k_fullsensor_phoenix	3K	9.00 µm	35mm	none	1797 x 2514	3024 x 2128	1K
3k_wien	3K	9.00 µm	35mm	none	1797 x 2514	200 x 200	1K
3k_wien2	3K	9.00 µm	35mm	none	1797 x 2514	401 x 1439	1K
4k-2k_fullapp	4K -> 2K	9.00 µm	35mm	none	1797 x 2514	2048 x 1556	1K
6k	6K	9.00 µm	35mm	none	1797 x 2514	5460 x 4150	1K
6k-2k_fullan	6K -> 2K	9.00 µm	35mm	none	1797 x 2514	2048 x 1556	1K

Click the **Geometry** button to open the **Select Output Geometry** dialog. In this dialog, the already defined geometry settings are displayed and can be selected (if available):

Geometry	Name of the geometry preset.
Sampling	The <i>oversampling</i> (page 26) setting. Available modes are: 3k (no oversampling) 6k (no oversampling) 3k -> 2k (4:3) 6k -> 4k (4:3) 6k -> 2k (8:3)
Native Pitch	The <i>native pitch</i> (page 29) setting. This affects the positioning of optics and sensor.
Gate	The available gates are 35 mm and 16 mm.
Adaptor	Displays whether the 16 mm adaptor has to be fitted or not. The adaptor is used when scanning 16 mm film on the ARRISCAN.
Origin	The top left corner of the scanned area. The origin is measured relative to the reference perforation and the reference edge of the film. The preset values are those defined in SMPTE standard S059. These values cannot be changed by the user, but there are additional offset parameters in the geometry panel (see below).
Size	Size of the scanned image in pixels. These values can be adjusted by the user in the geometry panel (see below).
Proxy Geometry	Displays the selected <i>Proxy Geometry</i> (page 128).

The list of geometry settings can be resorted by clicking on any column. Clicking again on the same column changes the sort order. Changed geometry settings can be saved under a new name in the database.

Resolution Selection

Select Geometry Format								
Resolution	Sampling	Native Pitch	Gate	Adaptor	Cal	Origin [µm]	Size [px]	
2048acAcad	3K -> 2K	8.04 µm	35mm		●	1797 x 2514	2048 x 1390	
1920acS16	3K -> 2K	4.82 µm	16mm	x	✗	8880 x 7990	1920 x 1080	
1920acFullap-HQ	6K -> 2K	9.60 µm	35mm		●	1797 x 2514	2048 x 1556	
1920acFullap	3K -> 2K	9.60 µm	35mm		●	1797 x 2514	1920 x 1080	
1920acAcad-HQ	6K -> 2K	8.57 µm	35mm		●	1797 x 2514	1920 x 1080	
1920acAcad	3K -> 2K	8.57 µm	35mm		●	1797 x 2514	1920 x 1080	
1828acFullap-HQ	6K -> 2K	10.08 µm	35mm		●	1797 x 2514	1828 x 1390	
1828acFullap	3K -> 2K	10.08 µm	35mm		●	1797 x 2514	1828 x 1556	
1828acAcad-HQ	6K -> 2K	9.00 µm	35mm		●	1797 x 2514	1828 x 1556	
1828acAcad-Diagonal	4K -> 2K	9.00 µm	35mm		●	1797 x 2514	1828 x 1556	
1828acAcad	3K -> 2K	9.00 µm	35mm		●	1797 x 2514	1828 x 1556	
16mmZeiss_3K	3K	0.00 µm	16mm		✗	0 x 0	2048 x 1556	
16mmZeiss6K	6K	0.00 µm	16mm		✗	0 x 0	4096 x 3112	
16mm_pure	6K -> 4K	0.00 µm	16mm		✗	8880 x 7990	2056 x 1556	
16mm_Norm-HD	6K -> 4K	0.00 µm	16mm		✗	8880 x 7990	1920 x 1080	

The geometry settings are based on predefined resolution presets that can be brought up by clicking on the **Select Resolution** button. This opens the dialog shown above which shows a list of presets and their parameter settings:

Resolution	Name of the resolution preset. Names consist of the width of the scanned frame in pixels and the corresponding area on the film. The area of the film is labeled according to the following scheme: <i>acFullap</i>: Across Full Aperture; means that the crop AOI covers the full aperture of the frame. <i>acAcad</i>: Across Academy; means that the crop AOI covers the academy aperture (which leaves room for the soundtrack). <i>HQ</i>: Full Quality; means that additional oversampling is used to further reduce alias.
Sampling	The <i>oversampling</i> (page 26) setting. Available modes are: 3k (no oversampling) 6k (no oversampling) 3k -> 2k (4:3) 6k -> 4k (4:3) 6k -> 2k (8:3)
Native Pitch	The <i>native pitch</i> (page 29) setting. This affects the positioning of optics and sensor.
Gate	The available gates are 35 mm and 16 mm.
Adaptor	Displays whether the 16 mm adaptor has to be fitted or not. The adaptor is used when scanning 16 mm film on the ARRISCAN.

Cal	Displays whether there is a valid machine calibration for the corresponding resolution or not.
Origin	The top left corner of the scanned area. The origin is measured relative to the reference perforation and the reference edge of the film. The preset values are those defined in SMPTE standard S059. These values cannot be changed by the user, but there are additional offset parameters in the geometry panel.
Size	Default size of the scanned image in pixels. These values can be adjusted by the user in the geometry panel.

The list of presets can be resorted by clicking on any column. Clicking again on the same column changes the sort order. The resolution presets are predefined templates that cannot be changed. However, you can create your own settings from a preset with the desired sampling and pitch parameters and edit the geometry setting to taste. Note that you are limited here to the predefined native pitch settings.

For information on how to create custom pitches, see *Creating Custom Pitches* (page 169).

Size

The size parameters define the size of the scanned image in pixels. This is also called the output crop AOI. The size can be changed by typing new values into the input boxes in the geometry panel or from the viewer marquee as described in *Marquee Handling* (page 75). The resolution presets contain common values for the image size which are used to initially set the size values when the resolution is changed. The size parameters are the only parameters of the resolution presets that can be redefined by the user.

Most of the time, the size of the output crop AOI is set to defined values that are taken from the resolution preset or are typed into the input fields. Be careful not to change the crop size by accident in the viewer.

Offset

The offset setting allows the user to position the image within the film frame. This value is measured in pixels. It can be set by typing values directly into the edit boxes in the geometry panel. It is also possible to set the offset from the viewer marquee as described in *Marquee Handling* (page 75).

The offset parameter is applied relative to the origin defined in the resolution presets. The origin defines the top left corner of the frame recorded by the camera. If both offset parameters are set to zero, the output crop area will sit flush against the top and left sides of the camera frame.

Image Crop Assignment

The base+lights calibration, auto focus, and histogram simply operate on the AOI defined by the marquee. For setting the image crop with the marquee, the GUI provides some additional functionality:

- When a different geometry is selected in the *Geometry Panel* (page 124), the marquee is automatically set to the dimensions and offset of the new geometry.
- There are two buttons in the Geometry Panel for setting the image crop from the marquee coordinates:



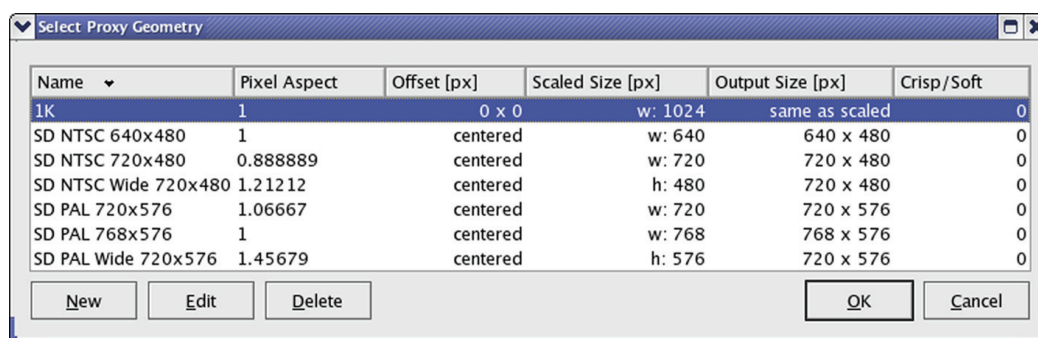
Marquee-To-Crop: Sets the **Offset** and **Size** parameters in the **Geometry** panel from the marquee.



Crop-To-Marquee: Sets the marquee from the **Offset** and **Size** parameters in the **Geometry** panel.

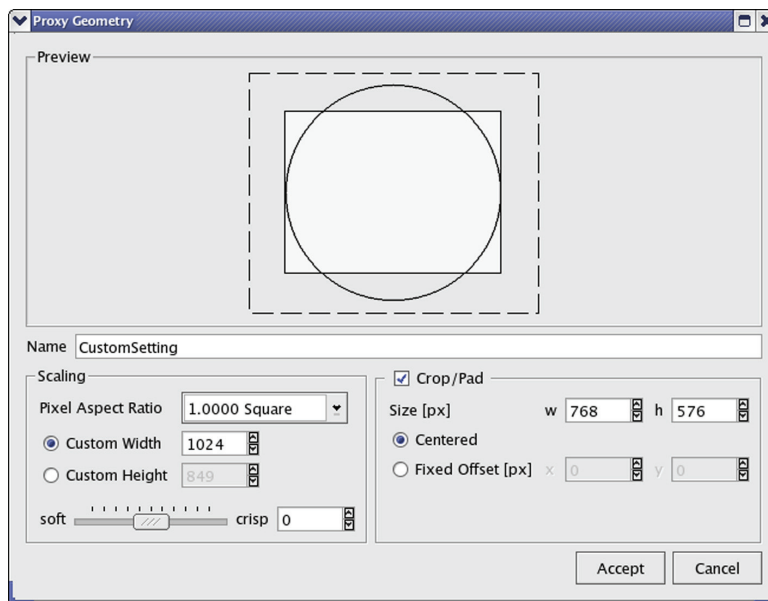
- After it is set to the crop coordinates, you can manipulate the marquee. The settings of the **Offset** and **Size** parameters in the **Geometry** panel are not affected until you click the **Marquee-To-Crop** button.
- When you save the geometry, the **Offset** and **Size** parameters are compared to the marquee coordinates. If they differ, a dialog is displayed warning the user that the marquee has been changed. The user then has the option to set the image crop to the marquee coordinates or to leave the crop as it is. This makes sure that any changes to the marquee are not lost even if the user forgets to press the **Marquee-To-Crop** button.

Proxy Geometry



When the selection button labeled **Proxy** is clicked in the **Geometry** panel, a proxy geometry can be selected in the dialog shown above. The proxy geometries are stored as presets in a separate database table (similar to the base resolutions for the high-resolution image that are accessed through the **Select Resolution** button). There are a number of predefined settings for the proxy geometry. In addition, an arbitrary number of user defined settings can be generated. This is done by selecting any setting in the dialog and clicking the **Edit** button at the bottom left.

Editing the Proxy Geometry



The screenshot above shows the dialog for editing the proxy geometry. The proxy is defined using two settings:

- The scaling determines how the high-resolution image is downsized.
- The rescaled image can optionally be cropped and padded to a fixed output size.

This allows you to define a proxy geometry of a fixed output size even if the aspect ratio of the high-resolution image does not match the desired proxy format. For example, proxies for output to an SD PAL video signal must have a size of 768 by 576 pixels (using a square pixel aspect ratio). The ARRISCAN's proxy mechanism can automatically scale different high-resolution geometries to fit into an image of this size. To achieve this, the scale is defined by the desired pixel aspect ratio (to support video formats that require non-square pixels) and either the width or the height of the scaled image. If the width of the scaled image is specified, the height is calculated automatically and vice versa. At a pixel aspect ratio of 1, the proxy has the same aspect ratio as the high-resolution image.

The intermediate scaled image is then cropped and padded by defining the desired output image size and placing the scaled image inside this output image. If the intermediate image is smaller than the output size, black margins (letterboxes or pillarboxes) are automatically created. If the intermediate image is larger than the output size, the image is cropped to the output size.

The size of the intermediate image must be smaller than 1025 by 721 pixels. This restriction is imposed by the fast high-quality rescaling algorithm used.

The preview pane located at the top of the dialog shows the relationship between the intermediate image and the output image:

- The size of the intermediate scaled image is drawn as a dashed outline. A circle inside this outline visualizes the pixel aspect ratio. If non-square pixels are specified, the circle becomes an ellipse.
- The size of the output image is drawn as a solid outline. If the intermediate image is smaller than the output image (as in the screenshot above), the resulting black margins (letterboxes or pillarboxes) are also shown.

The scaling of the proxy is set with the following controls:

Name	Displays the name of the proxy geometry setting. This name cannot be edited. To change a name of a setting, create a new setting based on the old setting and delete the old one.
Pixel Aspect Ratio	Selects the pixel aspect ratio from a range of presets for PAL and NTSC video formats. Alternatively, any desired pixel aspect can simply be typed into the selection box.
Custom Width	Activate this option to scale the intermediate image to the specified width. The height is calculated automatically from the aspect ratio of the high-resolution image and the specified pixel aspect ratio.
Custom Height	Activate this option to scale the high-resolution image to the specified height. The width is calculated automatically (as described above).
Filtering (soft/crisp)	Controls the sharpening of the proxy image independently of the high-resolution image. This allows fine tuning the look of the proxy for best appearance on the target output device, for instance a video monitor.

If the **Crop/Pad** check box is activated, the controls below can be used to set the cropping and padding of the output image.

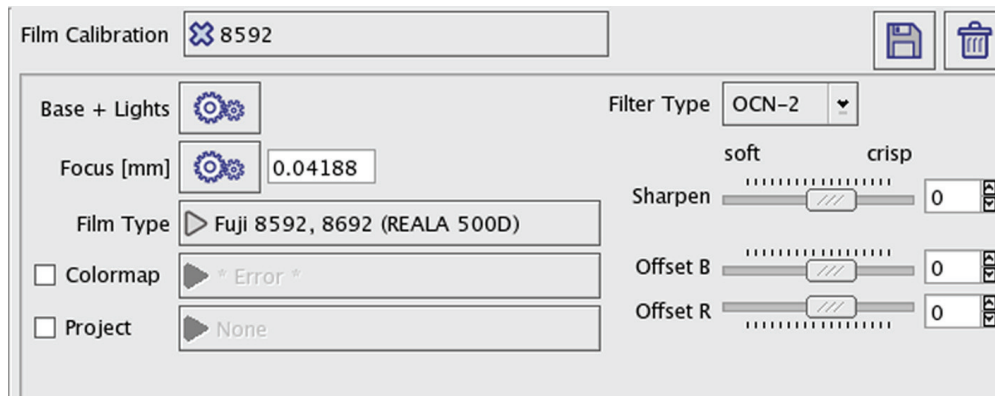
Size	Enters the size of the output image. This is always the size of the output file regardless of the scaling settings.
Centered	Activate this option to automatically center the intermediate image relative to the output image. With this setting, the proxy geometry will work for high-resolution images of any aspect ratio. This is normally the desired behavior.
Fixed Offset	Activate this option if an asymmetric placing of the intermediate image relative to the output image is desired. In this case, the placement of the intermediate image will only be correct for one specific high-resolution image size.

Info Area

The info area at the bottom of the **Geometry** panel shows the geometry parameters that cannot be modified by the user. Some of these are also displayed in the **Resolution Selection** *dialog* (page 126), while others are displayed here exclusively.

Sampling	Displays the oversampling mode from resolution preset (see above).
Final Pitch	Displays the final pitch calculated from native pitch and oversampling. See also <i>Native And Final Pitch</i> (page 29).
Native Pitch	Displays the native pitch setting from resolution preset (see above).
Lens Type	Displays the lens type (obtained from the machine calibration).
Proxy	Displays the pixels aspect ratio and the size of the proxy images in pixels.

3.8.2 Film Calibration Panel



The **Film Calibration** panel is used to set the calibration parameters that depend on the film type.

Base + Lights Calibration

The **Base + Lights** button  starts the calibration of the film base correction and maximum film transmittance. The process is discussed in more detail in *Base + Lights Calibration* (page 33). The calibration is carried across the image area defined by the viewer marquee. During the calibration, a progress dialog is displayed. The progress takes a few seconds.

It is sometimes difficult to find a frame where the clear base of the film is visible. In these cases, the narrow strip (frame line) between frames can be used. Sometimes it is helpful to use the perf forward and perf backward buttons of the film transport strip to move the frame line into the gate area. For best accuracy, the base + lights marquee should be set as large as possible. If the marquee area is too small, the calibration may fail.

Filter Type

With the controls in this section, you can tweak the ARRISCAN's image processing filters. The filter type drop-down box allows you to choose between three different filter kernels:

OCN-2	Original Camera Negative
	This filter is optimized to minimize aliasing effects caused by the film's grain structure. Use this kernel when scanning material that originated on camera negative film. This includes original camera negative as well as copies of negative film that were made on intermediate stock. For more information on scanning copies of negative film see <i>Data From Interpositive Material</i> (page 138).
OCN-1	This is an older version of the OCN filter. For all new work, it is strongly recommended to use the OCN-2 filter set. The OCN-1 filter is still provided for compatibility, for instance for rescans. For more details see <i>OCN-2 vs OCN-1</i> (page 255).
HICON-1	High Contrast
	Use this kernel when scanning high-contrast images with very little grain. This includes test images on low-grain stocks such as intermediate material. On this type of material, the OCN-1 filter can lead to artifacts.

Below the filter type box, there is a slider for setting the amount of sharpening applied to the image. At a setting of zero, the filter preserves the sharpness of the film. The range of the slider depends on the filter type and downsampling rate. The value is also displayed in the box next to the slider. Instead of using the slider, you can type a value directly into the box.

When using the OCN-2 filter, there are also sliders for separately adjusting the sharpening for the red and blue color channels. These sliders specify an offset relative to the general setting of the top slider. Therefore, if the offset sliders are used, the main slider at the top shows the sharpening setting for the green color channel. The settings for the red and blue channels are then determined by adding the offset to the main setting.

For instance, if the main slider is set to +2, the red offset is set to -1, and the blue offset is set to -3, the resulting absolute settings are R: +1, G: +2, B: -1.

The setting of the sharpening filter is a creative decision that depends on the material to be scanned. Note that many film stocks are already designed to increase the sharpness of the image. These stocks use a photochemical process that creates an effect very similar to that of a digital sharpening filter. Artificial sharpening methods are based on edge contrast enhancement which can result in visible artifacts depending on the contrast of the image and the amount of sharpening applied. Therefore, the setting of the sharpening filter is best determined in a test series together with the colorist.

The OCN-2 filter allows to go up to rather high sharpening levels. These settings are provided for extended creative control of the final image. Use these controls carefully; at very high sharpening settings artifacts may appear in some images.

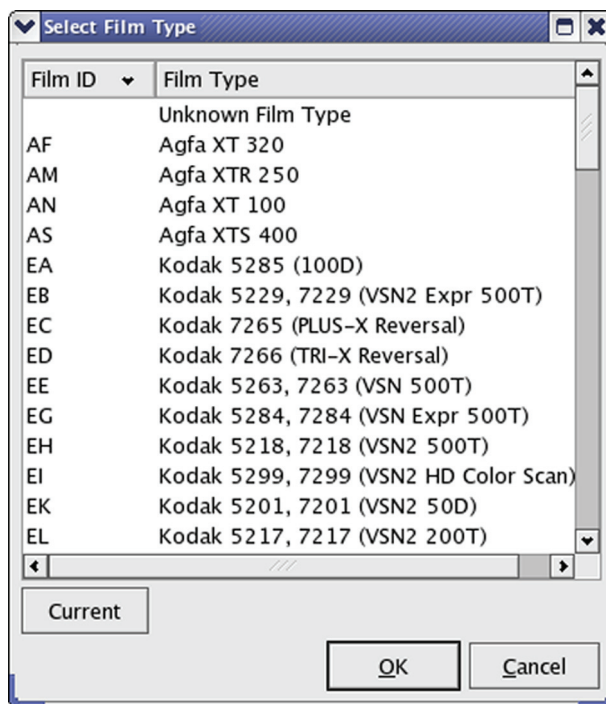
Focus

The focus offset value is used to compensate the focus position for different film materials, as explained in *Pitch and Focus* (page 30). You can type in a value manually, but normally this value is measured automatically:



Starts an auto focus procedure that determines the focus offset automatically. The focus is measured within the AOI defined by the viewer marquee. The algorithm uses the contrast of the image on the film to determine the best focus. The film grain usually provides enough contrast for this.

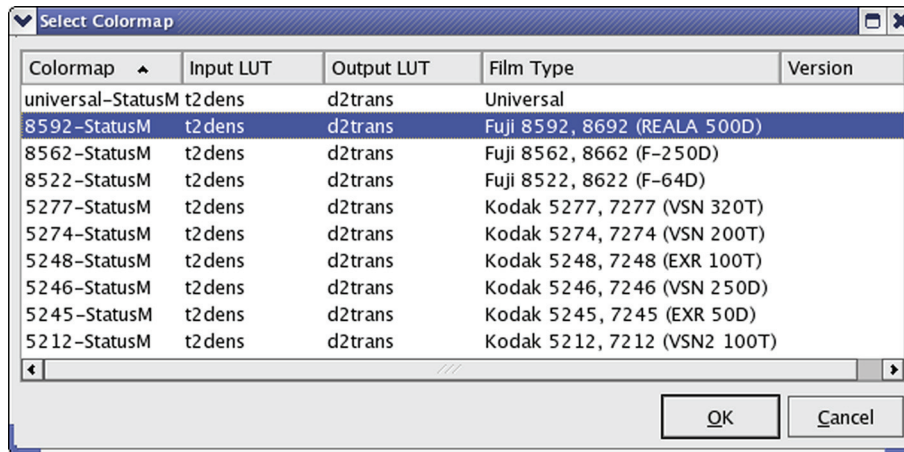
Film Type



The **Film Type** button opens the dialog shown above where you can choose from different film types or select the one of the film currently loaded (as recognized through the key code) from the ARRISCAN detected.

Colormap

The **Colormap** check box activates the color management system for different film stocks. As explained in *Film Calibration* (page 33), the system is based on conversion matrices (called *colormaps*) that are applied on logarithmic data. When the **Colormap** check box is activated, the selection button is activated. Click the button to open the **Select Colormap** dialog.



Colormap	The conversion matrix for calibrating the image data. ARRI provides two colormaps for each film stock: one that results in data that is calibrated to <i>Status M</i> , and one for calibrating to <i>Printing Densities</i> .
Input LUT	Defines the lookup table used for converting the data before the colormap is applied. When using the colormaps provided by ARRI, this entry must be set to t2dens , which is the LUT for converting from transmittance to density.
Output LUT	Defines the lookup table that is applied after the colormap. When using the ARRI colormaps, this must be set to d2trans , which converts from logarithmic densities back to linear transmittance data.
Film Type	Indicates the film type to which the colormap belongs to.

In case you want to use your own color matrices please contact ARRI for support and selecting the correct input and output LUTs.

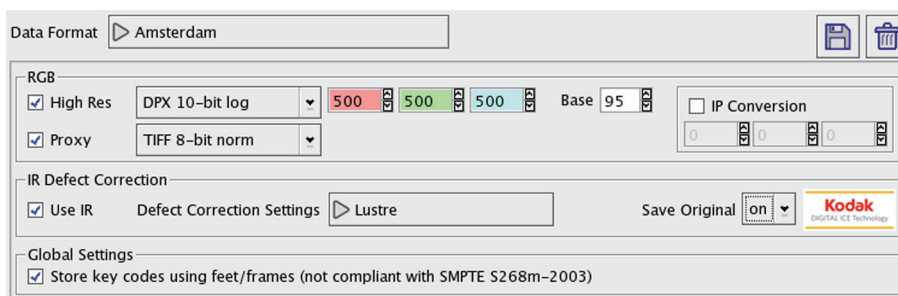
Project

In order to enable a film calibration for automatic selection, it must be assigned to a project.

- Activate the **Project** check box. Now you can select a project. The calibration is then assigned exclusively to this project, that is, it will not be used in any other project.
- Activate the **Project** check box. Now you can select **All**. The calibration is then assigned to all projects. Only one film calibration per film stock can be saved linked to all projects.
- Clear the **Project** check box. The button displays none, that is, the calibration will never be used by any job whose calibration is set to 'Auto'.

For more details see *Automatic Selection of Film Calibration* (page 172).

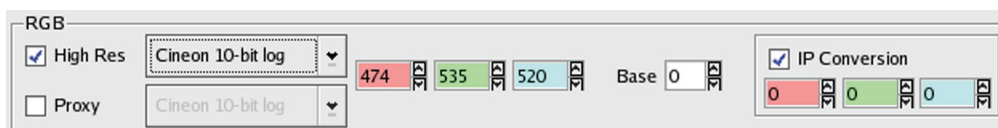
3.9 Data Format Panel



The **Data Format** panel defines the file formats of the image files produced by the ARRISCAN. You can define different formats for the high-resolution image and the *proxy image* (page 173).

The panel has separate drop-down menus for the high-resolution file format and the proxy file format. The configuration parameters for the file format are displayed to the right of the format menu. There are two groups of formats: logarithmic and custom. Each group has its own set of configuration parameters. If the high-resolution image and the proxy image use a format from the same group, they both share the same parameter settings. In this case, only one set of parameter controls is displayed in the panel. If the two images use formats from different groups, there are separate parameter controls for each image.

Logarithmic File Formats



There are two logarithmic file formats: **Cineon 10-bit log** and **DPX 10-bit log**. Both save the image data with a resolution of 10 bits per color channel.

There are two types of parameters for logarithmic file formats: gain and base. Both control the conversion from linear to logarithmic space. The gain can be adjusted for each color channel separately, while there is only one base parameter for all channels. If both the high-resolution and the proxy check box are activated, you can also decide whether to perform an *IP Conversion* (page 138) or not.

Gain Factors



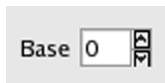
The gain factors are the factors used to convert the measured film density to code values in the output file. In other words, they control the brightness of each color channel. There are three boxes whose backgrounds are colored red, green, and blue, respectively, for setting the gain of each channel.

The gain values describe how many code values are distributed over the dynamic range of 1 density.

The standard gain setting is 500 for all colors ('unity gain'). In this case, the density difference between two pixels of one code value difference is 0.02d ($1d / 500$), the dynamic range of the logarithmic output file is therefore 2.048 densities ($0.02d * 1024cv$).

Normally, the gain should be left at the standard setting unless the color management scheme that is used requires different values. Another common configuration is to use a setting of 541 in the red channel to conform to the Carlos aim for calibrating the ARRILASER film recorder.

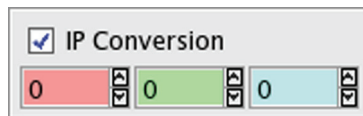
Base



The base value defines the code value in the output file that corresponds to the darkest area (lowest density, unexposed film); the typical value is 95, which is equivalent to 0.19 log D. This is approximately the same offset by which the densities in an optically printed internegative are shifted.

If an internegative is scanned, you should set the offset to zero since the material already carries a density offset.

Data From Interpositive Material



The controls in the **IP Conversion** box are used to tweak the colors when scanning interpositive material. The controls are available only if both high-resolution and proxy image are set to logarithmic formats. If the **IP Conversion** check box is activated, the saved image is not inverted as it would be normally (which is the desired behavior for negative film). In addition, there are three offset values for the red, green, and blue channel, respectively. These values shift the brightness of the color channels. They are specified in units of printer lights.

Note that this setting is only for copies of camera negative on intermediate stock. There is currently no support for scanning print film with a much higher density than other film stocks. Please contact ARRI if you need to scan print film.

Custom File Formats



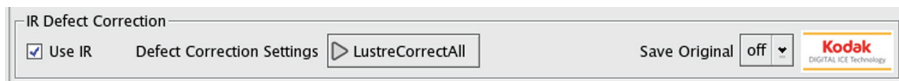
The ARRISCAN offers the following custom output formats:

Cineon 10-bit	16-bit linear data that is converted by a user defined (logarithmic or non-logarithmic) LUT to 10-bit Cineon files.
DPX 10/16-bit	The DPX format is not limited to storing 10-bit logarithmic data. However, some programs may not be able to load such files even though they support logarithmic DPX files.
TIFF 16-bit	The TIFF format is a standard format for storing high-quality graphics. It is widely supported.
TIFF 8-bit	Output to TIFF files with 8 bits per channel is only available for proxy files.

For each format there is the option of storing the unconverted (normalized) data or to convert the data using a custom LUT. In order to obtain image files that are compatible with standard postprocessing software, ARRI provides a number of pre-calculated output LUTs. In addition, users can create their own custom LUTs. Please contact ARRI for more details.

Note that some of the custom LUTs modify the color rendering and/or the contrast (gamma) of the output image. This is often desirable for preview images such as proxies, but may not be suitable for high-quality output.

Defect Correction (Digital ICE)



IR-based defect correction is activated in the *Data Format Panel* (page 137). If the **Use IR** check box is activated, the additional IR image is acquired during scanning and the high-resolution image is automatically corrected by DICE. In addition, a defect map is generated containing the defects in the image. The defect map is configured in the **Defect Correction Settings**, which are described below.

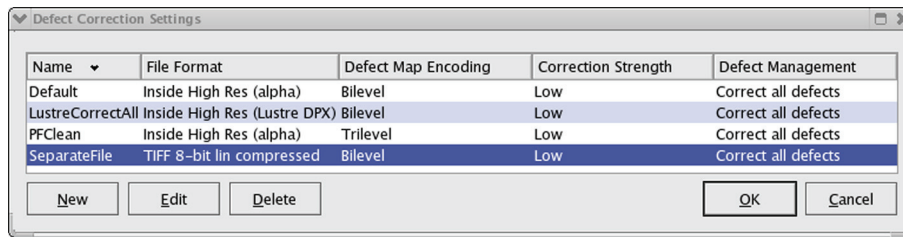
To use Kodak's DICE technology, a commercial license has to be obtained. For more information, see *Licensing DICE* (page 252).

Sometimes it is desirable to retain a copy of the uncorrected image without any corrected defects. To do so, select **on** in the **Save Original** list.

In this case, you have to set the location where the copy of the uncorrected image is saved. To set the location, open the job settings in the Job Editor, open the **File Setup** tab and enter the path in the **High Res Original** box which is only active when an output format with active **Save Original** option is selected.

For some film stocks, it is essential that the correct film type is specified in the **Film Calibration** setting in the **Acquisition** tab. Notably Kodak Vision 50 D (5201) behaves differently from other film stocks and DICE needs to know about this. If the film type is not set correctly, no defect correction can be applied and the defect map is completely white.

Defect Correction Settings

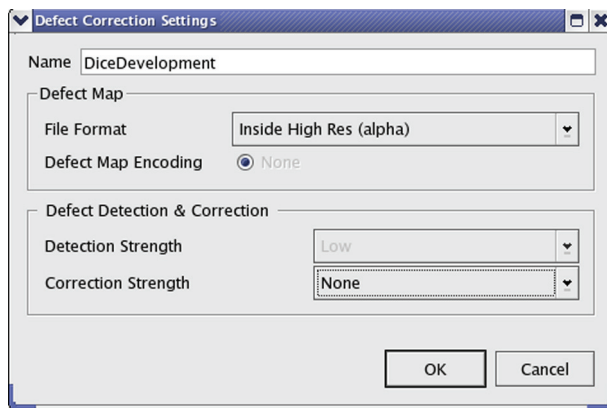


There are a number of parameters for configuring DICE, such as the format for storing the defect map on disk, the correction strength, and the handling of severe defects. These parameters are stored as configurable presets in a separate database table. This allows the user to create presets for different purposes and share them between several data format settings. For instance, if you use a specific third party application for further processing of the defect map, you only need to create a single preset that stores the map in the format that is understood by this application.

The configuration presets are selected from the **Defect Correction Settings** selection button, which opens the dialog shown above. To select an existing setting, simply select the setting in the dialog and click **OK**. To edit an existing setting, select the setting and click **Edit**. Note that the 'Default' setting cannot be edited. To create a new setting, select a setting that you want to use as a template for the new setting and click **New**.

Settings that are not compatible with the current high resolution file format cannot be selected and are shaded. For instance, when the high-resolution file format is not DPX, you cannot select a defect map setting that stores the defect map inside the high-resolution DPX file. This can sometimes be confusing, especially since it is possible to create a new setting that is incompatible with the current data format.

Editing the Defect Correction Settings



New or existing settings are edited in the dialog shown above. Depending on the file format chosen, some of the options may not be available.

Defect Map

The defect map can be stored either inside the high-resolution image or as a separate file. If the defect map should be stored as a separate file, the location where the file should be saved has to be set. To set the location, open the job settings in the Job Editor, open the **File Setup** tab, and enter the path in the **Defect Map** box.

The following formats are available:

- | | |
|------------------------------|--|
| Inside High Res (alpha) | Saves the defect map as the alpha channel within the high-resolution image. Note that although Cineon and DPX files can have more than three color channels, many applications cannot open such images. |
| Inside High Res (Lustre DPX) | This is a new format supported by Autodesk/Discreet Lustre starting at version 3.0. The defect map is saved to the 2 unused bits of the DPX file. The resulting DPX file does not increase in size. This format is available only if the selected high-resolution output format is 10 bit DPX. Even applications that cannot read the additional defect map information can usually open this type of image. |

Inside High Res (dual element DPX)	This is a new format supported by The Pixel Farm's PFClean restoration software. The defect map is stored as a second image element inside the DPX file. The file size increases only marginally. This option is available only if the selected high-resolution output format is 10 or 16 bit DPX. The additional image element uses only one bit per pixel and thus only supports bilevel defect maps.
TIFF 8-bit lin	Save the defect map as an 8-bit linear TIFF image.
TIFF 8-bit lin compressed	Save the defect map as a compressed 8-bit linear TIFF image.
Don't save	Do not save the defect map.

Note that the Lustre DPX format does not strictly conform to the SMPTE DPX standard. Nevertheless, most readers will recognize these files as RGB images. Also note that DPX files with alpha channel, although standard conform, are not compatible with many DPX readers. The same goes for dual image element DPX files, which are currently only supported by PFClean.

The defect map can either be a trilevel or a bilevel map. The bilevel map has only two values (defect or non-defect), while the trilevel map differentiates between *correctable* and *critical* defects. Correctable defects are shallow defects that can be fully reconstructed by DICE. Critical defects are bigger or deeper so that there is not enough image information left for DICE to reconstruct the image.

A bilevel map includes only the critical defects, as these will need additional quality checks or dust busting. A trilevel map marks the critical defects as maximum value and the correctable defects as mid gray. When in doubt, the software will mark a defect as critical rather than correctable.

Please note that both the Lustre format as well as the dual image element DPX format are only capable of storing bilevel maps. If one of these formats is selected, the trilevel option is not available.

The encoding of the two different types of defect maps is described in detail in the Appendix *Defect Map Encoding* (page 253).

Defect Detection & Correction

The parameters in this section control how the defects are detected and corrected in the high-resolution image.

With the first parameter, **Detection Strength**, DICE can be made more or less sensitive in detecting defects.

Low	Lower detection sensitivity. Less defects are recognized.
High	Higher detection sensitivity. Less risk of missing defects but more likely to classify non-defective areas of the frame as defects.

With the second parameter, **Correction Strength**, DICE can be made more or less aggressive in tackling defects. When the correction strength is set to **Low**, only smaller defects are corrected. When set to **High**, DICE will also correct defects that are larger in size, but at the risk that artifacts can occur when the defect is too severe. The restored areas may then have reduced grain structure and appear slightly flatter or softer. Such areas will be marked as 'critical' in the defect map.

Low	Conservative correction algorithm for smaller defects. Virtually free of artifacts, but may leave many damaged areas untouched.
High	Aggressive correction algorithm that can handle larger defects, but may introduce artifacts.
Detect Only	Defects are detected and a defect map is created, but no correction is applied to the high resolution image. This is not recommended as DICE takes advantage of the full information from the ARRISCAN's infrared color channel to recover the original image.

Global Settings

Key code data can be written to image file headers. This is currently supported only by the Cineon and DPX file formats. As described in *An Introduction to Key Code* (page 160), there are two ways to specify a film position with key code: using the key code count (as printed on the film edge) with the offset specified in perfs, or using a feet counter with the offset specified in frames. While the former method is always perf-accurate, the latter requires additional perf information and the number of perfs per frame must also be known.

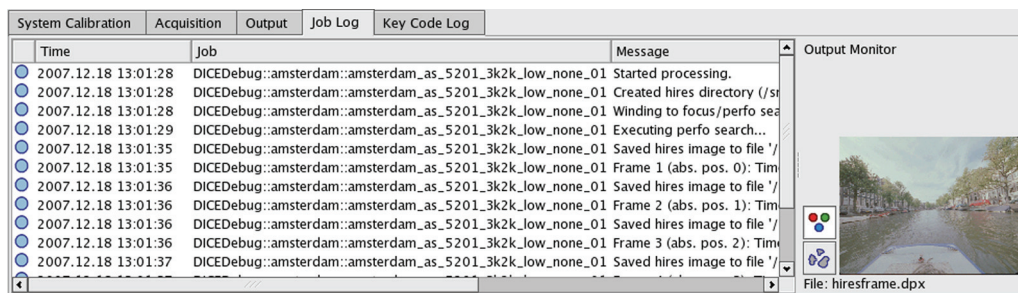
The DPX file format is standardized in SMPTE Standard S268M-2003. This standard defines that the key code information in the DPX file header is in count-perf format (and therefore perf-accurate). Unfortunately, most postprocessing software does not conform to the standard using the feet-frame format instead. The ARRISCAN supports both formats. You can select **Store key codes using feet/frames (not compliant with SMPTE S268m-2003)** to write non-standard DPX files if your postproduction chain cannot deal with perf offset.

However, in order to retain the perf-accurate information when using feet-frame format, the ARRISCAN writes additional information into a reserved area of the DPX movie information header. This has become necessary because the standard does not define any fields for this information (since in the standard, the key code position is perf accurate already). Since the ARRISCAN is using an area marked as 'reserved' for this, the resulting DPX files are still compatible with other applications. For more details on the information that the ARRISCAN writes into the DPX header see *The ARRISCAN DPX File Header* (page 238) .

3.10 Information Panels

The information panels monitor the status of the job processing engine and the key code detection system.

3.10.1 Job Log



The Job Log panel is used to monitor the processing of jobs. It consists of a display area for log messages on the left and an output monitor for previewing the scanned image on the right. You can drag the vertical strip between the two areas to adjust their relative sizes.

During job processing, the daemon sends log messages that are shown in the message area. The messages consist of the following parts:

Message Type The type of message is denoted by an icon in the first column:

-  Standard message.
-  Warning message. Denotes a condition that needs to be checked. Job processing was not stopped.
-  Error message. A fatal error occurred. Job processing was stopped.

Time The time and date at which the message was created by the daemon.

Job Job where the event occurred in the format project::reel::job.

Message The text of the message describing the event.

The job processing messages are also logged in the job log file specified in the *Job Settings* (page 93). Note that if a GUI is started while a job is running, the GUI's job log only displays messages that were created after the GUI was started.

Only the last 500 messages are visible in the Job Log panel. Older messages are only kept in the job log file.

Output Monitor

This monitor view is identical to the *Job Preview* (page 88), only of smaller resolution.

3.10.2 Job Processing Info Bar



The Job Processing Info Bar gives you a short overview about the progress and speed of your currently running job. It is displayed instead of the Film Transport Controls during job processing.

In the center of the bar, there is a 'Stop' button for canceling job processing. There is no confirmation dialog when this button is pressed!

On the left of the bar, there is a progress bar showing how many frames of all selected jobs have already been scanned. The information about how many frames have been scanned both for the current job and for all selected jobs is shown below the progress bar.

On the right of the Info Bar there are a number of performance indicators. Most important is the **Save Queue Meter** on the top right. This shows the fill level of the save queue during job processing. The save queue is a buffer in the host computer memory that compensates throughput variations on the storage system. For example, if the load on the storage system is high and the ARRISCAN cannot write files as fast as they are being acquired, files are buffered in the save queue while the scanner continues to run uninterrupted. In this case the Save Queue Meter will show that the save queue is filling up: the fill level bar will start to extend to the right, and the fill percentage will increase. When the load on the storage system decreases, the ARRISCAN will start writing out files as fast as possible, and the fill level of the save queue will decrease again. However, if the storage system is blocked for too long, the save queue may fill up completely until the scanner needs to stop because there is no more room to buffer the processed files and will only continue the scanning process when the queue starts emptying again. There is a green indicator at the right of the save queue fill level meter. If the save queue fills up to a dangerous level, this indicator will change to a yellow cross. If the queue fills up all the way and the scanner stops, the indicator becomes a red cross. Once this has happened, the indicator will not change back to green even if the save queue empties out again. In this way it is obvious if a problem has occurred at some time during job processing.

There will always be a fill level of a few percent, and variations in the save queue's fill level are normal during job processing. However, if the save queue regularly fills up all the way during job processing, there is a problem with the file storage system because it cannot sustain the throughput required. This will slow down the scanner and put excess stress on film transport hardware.

Below the Save Queue Meter are four fields showing the frame rate during job processing:

- avg A sliding average of the current frame rate. This shows how fast the scanner is running at the moment.
- cur The frame rate measured at the last acquired frame. This is an indication of the variation of scanning speed from frame to frame.
- min The minimum frame rate since the start of the job. This is the lowest speed that was achieved since the job was started.
- max The highest frame rate since the start of the job. The average frame rate should always be near the maximum. Otherwise there may be a performance problem.

3.10.3 Key Code Log

System Calibration	Acquisition	Output	Job Log	Key Code Log	
					
Position	Key Code	Diff	Status	Film Type	
24.3	EV 60 2710-4887+00	0	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
32.3	EV 60 2710-4887+32	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
40.3	EV 60 2710-4888+00	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
48.3	EV 60 2710-4888+32	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
56.3	EV 60 2710-4889+00	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
64.3	EV 60 2710-4889+32	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
72.3	EV 60 2710-4890+00	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
80.3	EV 60 2710-4890+32	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
88.3	EV 60 2710-4891+00	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	
96.3	EV 60 2710-4891+32	32	value ok	Kodak 5242, 7242 (VSN Color Intermed)	

The Key Code Log panel displays status information on the ARRISCAN's key code logging system. The display area on the left shows a list of all key codes that were detected by the key code reader since the last film reel was loaded onto the scanner. The **Statistics** area on the right shows a summary of the status of all detected key codes.

Additionally, the ARRISCAN makes a short beep whenever a key code is detected by the key code reader.

There are three buttons on left of the Key Code Log panel:



To reduce communication overhead, the key code log is not updated automatically. Press this button to refresh both log display and statistics.



Clears the log. Note that this does not just clear the log display in the GUI, but also the logged data on the daemon.



Opens a dialog to specify metadata and saves the displayed log data as a text file. To make sure that the complete log is saved, click  before saving.

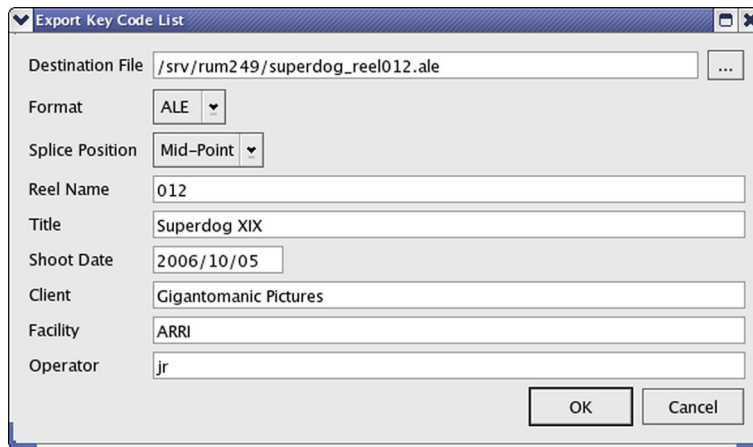
The key code log contains the following information:

Status icon		The logged key code is in a contiguous sequence.
		The key code is not in a sequence, but could be categorized properly and there are no undetected key codes around it (for example in a splice region).
		The key code was detected and categorized, but there may be a problem with the film (for example, if a sequence is running backwards, which may indicate that the film is not loaded correctly).
		The key code could not be categorized or the categorization is uncertain because of undetected key codes next to it, or it was not detected properly.
Position	Shows frame count and the key code offset in perfs.	
Key Code	The key code value in human-readable format.	
Diff	The difference (in perfs) between the positions of this key code and the last key code. For a contiguous sequence of key codes on 35 mm film, this value should be 32.	
Status	A brief status text.	
Film Type	The full film type specification as determined from the machine-readable key code information.	

The **Statistics** box shows an analysis of the key code log. Note that there is no figure for the total number of undetected key codes.

Number of entries	Total number of logged key codes.	
Contiguous entries	Number of logged key codes that are in a contiguous sequence (for example no key codes are missing).	
Skipped entries	Number of undetected key codes that belong to a contiguous sequence. Note that if there are many skipped key codes in a row, the detection system may decide that the sequence is not contiguous.	
Splices	Number of splices that the key code logging system has detected.	
Uncertain entries	Number of key codes that were detected, but could not be categorized (for example they don't belong to a sequence and they are not in a splice region). This usually indicates that a large number of key codes could not be detected.	
Backwards entries	Number of key codes that belong to a contiguous sequence, but the sequence is in descending order. This means that the film was either running backwards in the camera, or is running backwards in the scanner.	
Invalid keycodes	Number of key codes that could only be read partially. These key codes usually contain wrong information.	

Key Code Log Export

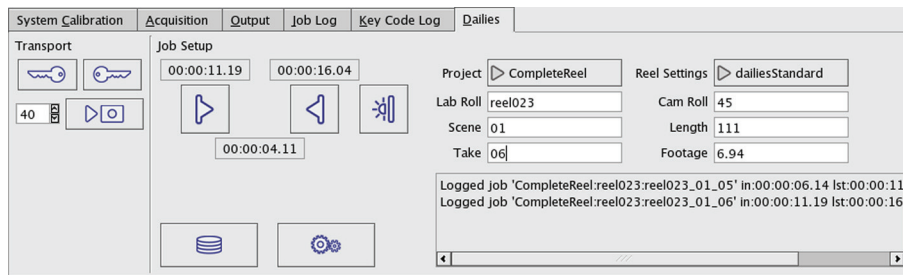


Most fields in the **Export Key Code List** dialog are self-explanatory. The **Splice Position** setting defines where the key code change occurs at a splice. The ARRISCAN's key code reader (and key code readers in general) can find a splice from the change in the key code, but it cannot determine the exact splice position. Therefore, it interpolates between the two positions where the last key code of the old sequence and the first key code of the new sequence were read. The ARRISCAN assumes that the splice is in the middle between these two key codes, but it will set the key code status in this uncertain area to 'in splice region'.

When exporting an ALE or FLEX file, you can choose where the key code change in the file should occur. All three options below are commonly used in postproduction environments.

- | | |
|-----------|---|
| Start | At the start of the new key code sequence, that is, where the first new key code was encountered. |
| Mid-Point | At the mid-point between the last key code of the old sequence and the first key code of the new sequence. |
| Overlap | Positions between the last key code of the old sequence and the first key code of the new sequence are logged as belonging to both sequences. |

3.11 Dailies Panels (DD only)



This tab contains two panels which provide functionality for dailies scanning, as shown in the screenshot above.

3.11.1 Film Transport Panel

The Film Transport Panel in the Dailies tab is used to locate punch frame positions. Normally the punch frame is placed on the first frame of the reel that has a full key code marker, that is, the key code offset is zero. The panel provides controls for automatically locating these key code positions even if the key code log is empty.

The controls in the Film Transport Panel are designed to be operated from the touch screen.



These two buttons are used to find the next key code position in reverse and forward direction, respectively. The frame which starts the key code foot is placed in the gate when shuttling stops.



After locating the punch frame use this button to position the punch frame so that it can be physically punched. When the button is pressed, the film is simply shuttled by the number of frames specified to the left of the button. Set this number so that the frame ends up in a convenient position, such as just before the first transport reel on takeup side of the scanner.

Using these controls, the procedure for punching is rather easy:

- Load the reel.
- Press  to locate the start of the first key code foot.
- Press  to shuttle the punch frame to the right.
- Look for the frame and punch!

3.11.2 Job Setup Panel

The Job Setup Panel in the Dailies tab can be used to define jobs for scanning on the fly. This is useful when a lab reel is not preselected and only keeper takes are to be scanned. The idea is that the operator uses the *Live View* (page 83) together with the *Jog Shuttle* (page 85) to locate the in and out points, for instance by looking for slates. The controls in the Job Setup Panel then allow to set the first and last frame of the job interactively. You can also enter metadata such as scene and take information. When all parameters are set, a new job can either be scanned immediately or logged to the database for batch processing.

The data acquisition settings for jobs created using the Job Setup Panel are defined by **Reel Settings**. These are similar to job definitions, but lack all positioning information. Reel settings are also used in *Complete Reel Processing* (page 119).



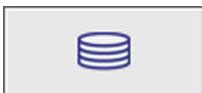
Click this button to use the current frame position as first frame of the job. The position is shown in time code format above the button.



Click this button to use the current frame as the last frame of the job. Note that this is not the out frame as specified in the job which is one frame behind the last frame.



If this button is active, the job will scan to the first detected camera flash. In this case, the controls for setting the last frame and job length are disabled.



Log the job to the database for later batch processing. A log entry appears in the log area at the bottom right of the panel. The job can be viewed and edited in the Job Editor.



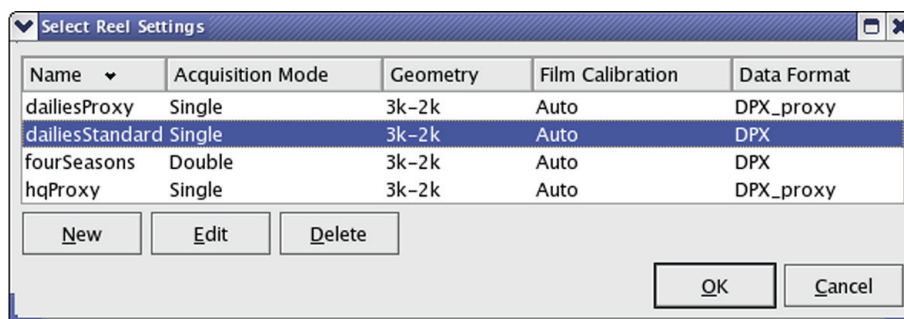
Log the job to the database and scan immediately.

Project	Used to select a project. Jobs created in the database will be assigned to this project. The reel settings for specifying the data acquisition parameters are also project specific.
Reel Settings	Selection button for selecting a reel setting. The data acquisition parameters of the selected reel setting are used when the job is created. Only reel settings that belong to the selected project are visible.
Lab Roll	Enter the lab roll name. Jobs created in the database will be assigned to a reel with this name. The job name is created from the lab roll name and the scene and take numbers.
Cam Roll	Enter the cam roll name. This is stored as metadata in the job.

Scene	Enter the scene number for the job.
Take	Enter the take number for the job.
Length	Length of the job in frames.
Footage	Length of the job in feet of film. This can be used to enter the length of a take directly from data that was logged on set.

Note that the time code fields for first frame, last frame, and duration, as well as the fields for length and footage can be edited directly. All other fields are adjusted automatically.

Selecting a Reel Setting



Reel settings are selected, created, edited, and deleted using a standard *Selection Button* (page 69). The settings created from the Job Setup Panel in the Dailies tab are also visible in the *Complete Reel Tab* (page 119) of the **Start Job Processing Dialog** and vice versa.

After a job is created it can also be edited from the Job Editor.

3.12 Status Bar



The status bar displays information on various system parameters. It consists of three areas:

- The status of the film transport system is shown on the left of the status bar.
- The job processing status is shown in the middle of the bar.
- The status of the key code detection system is displayed on the right.

The status message for each of the three components is displayed on a colored background. The color of the background depends on the status: a green background shows that the component is active and running properly. A yellow background appears when there is a condition that requires the attention of the user. For instance, the film transport status is shown with a yellow background when the transport mechanism is operating, when the transport is stopped near the end of a roll where the film may be accidentally spooled out, or when no film is loaded. A red background is used when there was an error. In addition, the job processing status is displayed with a neutral background if no jobs are being processed.

Film Transport Status

The general film transport hardware status display on the left of the status bar may show any of the following messages:

Ready	OK/green	Film is loaded, the loop control is active, and the film transport system is ready.
Spooling	Warning/orange	The film is being spooled.
Spooling (EOR)	Warning/orange	The film is being spooled and the transport system has detected that there is little film remaining on one of the platters. Further spooling may unload the film.
End of roll	Warning/orange	The film is stopped and there is little film remaining on one of the film platters. Spooling in the wrong direction may unload the film.
Unloading	Warning/orange	The film is being unloaded (the loop builders are being retracted).
Out of film	Warning/orange	There is no film loaded.
Initialized	Warning/orange	The film transport system is initialized, but it has not detected the film load status. This condition normally should not occur.

Not initialized	Error/red	The film transport system is not initialized. This condition normally should not occur. The system will be initialized automatically when the loading sequence is initiated.
Error	Error/red	The film transport hardware is in an error state and needs to be reset. This may require that the scanner is switched off and back on.

To the right of the general status display, there are a number of fields that display various settings of the film transport system:

35 / 16 mm	Current film gauge setting.
2 / 3 / 4 perf	Current setting of the number of perforations per film frame (size of frame step). Not available for 16 mm gauge.
24 / 25 / 30 fps	Current system frame rate as set in the <i>Set Reference Position Dialog</i> (page 115).
PTR in / out	Setting of the Particle Transfer Rollers.
S / M / L	Film core size setting for left and right film platter.
###	Optics position (in mm).
###	Sensor position (in mm).

Job Processing Status

The job status is displayed as a descriptive text:

No job running	Neutral	The job processing engine is idle.
Job processing started	Warning/orange	The job processing engine is starting up. Scanning has not started yet.
Processing jobs...	OK/green	Jobs are processed (images are scanned, processed, and saved).
Stopping...	Warning/orange	Job processing was canceled by the user. The job processing engine is stopping all processing tasks.
Job processing error	Error/red	Job processing could not continue because a fatal error occurred. Check the <i>job log panel</i> (page 146) for detailed error information.

Key Code Position Status

The key code log status can have one of the following states:

Log is empty	Warning/orange	No key codes have been logged yet (film was just loaded, log was recently cleared or key code track is switched to wrong side of the film).
Logged	OK/green	The current frame is directly at a key code position (perf offset 0 or 32).
Interpolated	OK/green	The current frame is between two key codes that are in a continuous sequence.
Extrapolated	Warning/orange	The current frame position is past the end of the key code log. The key code position is a guess. In normal operation, this should only happen when the film was loaded from tail (take up platter) since the key code reader is positioned so that enough key code information is gathered before a frame reaches the gate when winding forwards.
Splice	Warning/orange	The current frame is inside a splice region. The key code position is a guess.
Uncertain	Error/red	The log does not contain enough information to determine the key code position with absolute certainty. This is usually caused by key code reading errors.
Skip	Warning/orange	The current frame position is in a region where one or more key codes could not be detected, but the key code position could be interpolated correctly because the current position falls into a region where key codes are in a contiguous sequence.
Jitter	Error/red	A key code was detected at a different position than where it was first logged. This can be caused by problems with the film transport mechanism and may indicate that the film has jumped out of rack.
Backwards	Warning/orange	The key codes are in descending order. The film may have been running backwards through the camera or it may be loaded into the scanner incorrectly.
Invalid	Error/red	Indicates a key code detection error. The displayed key code may be (partially) incorrect.
Error	Error/red	Indicates an error within the key code detection system, such as a missing cable connection.

3.13 Keyboard Shortcuts

There are several keyboard shortcuts that make operating the ARRISCAN faster and more comfortable.

Single key shortcuts are only available when no text field is selected in the GUI. In this case, CTRL + shortcut key will have the same functionality.

Navigation

S	Show the Preview tab and trigger scan
Q	Show Live View tab
W	Show the Output Monitor tab
E	Show the Job Editor
I	Show Acquisition tab
O	Show Output tab
Y	Show/hide the bottom tab area
Z	Set the reference frame position
X	Open "Locate" dialog

Scan Viewer

CTRL + '+'	Zoom in
CTRL + '-'	Zoom out
C	Open histogram window
V	Open horizontal line profile
CTRL+ALT+V	Move the line profile to the center of the displayed area

Live View

U	Toggle zoom between fit all and fill width
ALT+CTRL+3	Brighten the view (also on ALT-Jog)
ALT+CTRL+4	Darken the view (also on ALT-Jog)

Film Transport

3	Step one frame backwards
---	--------------------------

4	Step one frame forward
CTRL+5	Step one perf backwards
CTRL+6	Step one perf forward
J	Shuttle backwards
K (or space)	Stop the film transport
L	Shuttle forward
ALT+K	Stop and go back to frame where ALT+K was pressed
CTRL-N	Change speed towards reverse direction
CTRL-M	Change speed towards forward direction
G	Start job processing

Dailies

[	Set in-point
]	Set out-point
\	Log job in database
'	Process job immediately
G	Start job processing

Start Job Processing Dialog

ALT+F	Select frame based scanning
ALT+K	Select key code based scanning
ALT+C	Select complete reel scanning
ALT+L	Toggle frame line detection
ALT+D	Toggle flash detection
ALT+R	Toggle automatic rewinding
ALT+S	Start processing

4 **Advanced Scanning Features**

This chapter describes selected advanced scanning features from a more common point of view and provides additional detailed background information to understand the basic concepts of these features.

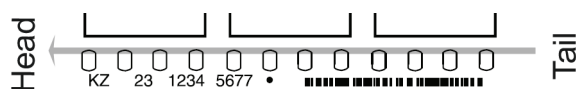
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4.1 An Introduction to Key Code

Key code is an identification tag printed on the edge of camera negative film. It consists of a two letter film identification code, a six-digit prefix number, and a four-digit count. For 35 mm film the count is incremented every 64 perforations, which equals 16 4-perf frames or one foot. For 16 mm film the count is incremented every 20 perforations, which equals the same number of frames or six inches.

Below is an example of the edge code on a 35 mm negative. The key code in the example would normally be written as "KZ 23 1234-5677+00".



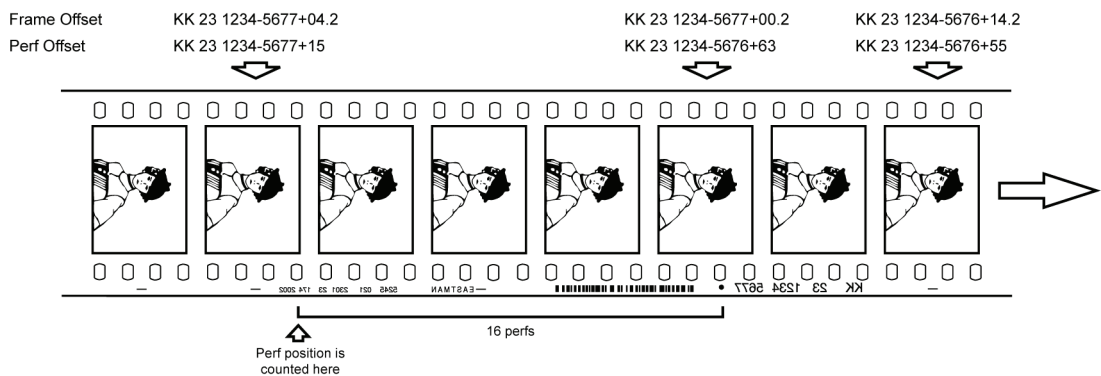
The dot between the human-readable key code and the barcode identifies the perforation to which the key code belongs. The barcode is read by the key code reader in the ARRISCAN. It contains additional information for identifying the film type not available in the human-readable code. For instance, Fuji film stock always uses the letters 'FN' in the human-readable code, with the complete film type info only in the barcode (however, Fuji film stocks can also be identified by the first digits of their prefix number).

When using 35 mm film, the number of frames within a key code interval depends on the frame size. In 2-perf or 4-perf format, there is a whole number of frames per foot: 32 and 16, respectively. However, in 3-perf format, there are $21 \frac{1}{3}$ frames per foot. Thus it takes 3 feet to obtain a whole number of frames. This results in an irregular sequence where the first two feet contain 21 frames and the third foot contains 22 frames.

The key code position of a frame consists of the edge code and an offset relative to the position where the key code is printed on the film edge. The offset can be given in frames (feet-frames format) or perforations (count-perf format). In film editing, it is common to use the former, while SMPTE standard 268M-2003 mandates that DPX file headers use the latter. Unfortunately, the SMPTE standard does not specify exactly how the perf offset is to be specified, and thus implementations differ between software manufacturers.

While the feet-frames format works well with 2-perf and 4-perf frames, for 3-perf frames a perf position needs to be specified in addition to the frame offset. This is done by adding a dot or 'p' to the key code, e.g. KZ 23 1234-5677+11.3 or KZ 23 1234-5677+11 p3. The perf position specifies the position where the key code's marker dot was found. In the first 21-frame-section of a 3-perf key code sequence, the first frame has the marker dot at the head perf ('.1' or 'p1'). The second 21-frame-section has the dot at the center perf ('.2' or 'p2'), while the 22-frame-sequence has the dot at the tail perf ('.3' or 'p3' as in the example). Note that the perf position may be specified for 2- and 4-perf key codes as well to get perf accurate key codes in feet-frames format. The DPX format is designed to support only count-perf format, so perf accuracy is lost when key codes are written into the DPX header in feet-frames format (which violates the SMPTE standard, but is nevertheless the format expected by most software).

Key Code Perf Offset in the ARRISCAN



The SMPTE standard for the DPX file format specifies that the key code offset is to be stored as a perf count, but it does not say how this count is to be obtained. Since it only makes sense to use a perf offset if it is possible to position the film perf-accurately using this offset, the ARRISCAN uses the top perf of the frame as the reference position.

The diagram above shows an example of how the perf offset is counted. The film runs from left to right with the emulsion facing towards the viewer, as it would be when looking into the gate of the ARRISCAN. Note that since the perf offset is counted at the top perf of the frame, the foot count at the first frame of a foot can differ between frame offset and perf offset:

- The frame offset is zero at the frame where the key code reference dot is. The dot position is counted from the top perf starting from one.
- The perf offset is counted at the top perf of the frame. If the key code reference marker in the frame that has frame offset zero is not at the top perf perf, the frame belongs to the previous foot when counting in perf offset, as shown in the diagram.

Therefore with frame offset, the position is given as feet and frames, whereas with perf offset, the position is given in key code counts and perfs.

Converting Between Frame And Perf Offset

Below are example functions written in pseudo code for converting the ARRISCAN's count/perf format to feet/frames format. These can be used in scripts or any other type of program.

The function `frame()` calculates the frame offset (perfsperframe is 2, 3, or 4):

```
frames(perfOffset, perfsPerFrame)
{
    framesPerFoot = ceil(64 / perfsPerFrame)
    frames = modulo(ceil(perfOffset / perfsPerFrame), framesPerFoot)
    if (perfsPerFrame == 3 && perfOffset == 62) frames = 0
    if (perfsPerFrame == 3 && perfOffset == 63) frames = 0
    return(frames)
}
```

The function `perfPos()` calculates the position where the key code marker dot was found on the first frame of the foot:

```
perfPos(perfOffset, perfsPerFrame)
{
    perfsPerFoot = 64
    if (perfsPerFrame == 3) perfsPerFoot = 63
    perfPos = modulo(perfsPerFoot - perfOffset, perfsPerFrame) + 1
    if (perfsPerFrame == 3 && perfOffset == 62) perfPos = 3
    if (perfsPerFrame == 3 && perfOffset == 63) perfPos = 2
    return(perfPos)
}
```

The function `feet()` calculates the feet position. This may differ from the key code's feet counter at the frame where the key code marker dot is found. When the marker dot is not at the top perf, which acts as the reference for the perf offset, the frame already belongs to the new count when using frame offset.

```
feet(frames, perfPos, count)
{
    feet = count
    if (frames == 0 && perfPos > 1) feet = count + 1
    return(feet)
}
```

4.2 Working with Time Code and Key Code

This section outlines some basic principles of movie editing using time code, key code or a combination of both.

4.2.1 Time Code-Based Workflow

The *time code* (page 269) based workflow is common in Europe and other regions of the world where the television norm is PAL (25 fps). The important steps are outlined below:

- The camera reels from the shooting are assembled into lab rolls, which are up to 600m (2000 ft) long. The film lab will sort out all takes that are not supposed to be used.
- Video dailies for off-line editing are created by transferring the entire lab roll with a telecine. At the beginning of each roll, a reference frame is marked with a punch frame. It is common practice to set the start time code of the punch frame to a full hour, i.e. 01:00:00:00 for the first reel, 02:00:00:00 for the second reel, and so on. In the PAL transfer, each video frame corresponds to one film frame. Therefore, the resulting video tape runs 4% faster than the movie (25 instead of 24 fps). Each lab roll is transferred to a separate tape, and the tape name or number is the same as the name/number of the lab roll.
- The video dailies are loaded into the off-line editing system. The system plays back at 24 fps retaining the original speed of the program.
- After editing, an EDL (Edit Decision List) is generated. The EDL contains the reel name and the source time code of each cut.
- Since each video frame corresponds to one film frame it is quite easy to locate the start of each clip on a lab roll. The roll is loaded into the film scanner, the punch frame is moved into the gate, and the time code is set to the same value that was used in the telecine transfer. The scanner software simply converts the source time codes from the EDL into frame numbers relative to the start of that frame.
- The generated DPX files have the source time code and tape name of the file header. Alternatively, the directory that contains the files is named as the tape and the source time code converted to a frame number is part of the file names.
- The DI software uses the same EDL that was used for scanning. Conforming is done by matching the tape name and source time code of each cut to the DPX files from the scanner.

The advantage of this workflow is that it is very simple and does not need a key code logger on the telecine. The scanner can always find the start frame since it simply needs to go to the specified frame position. Each processing job that is selected for scanning for the current reel is guaranteed to be scanned.

The disadvantage is that you can never splice out any takes from the film reels, for example to send some material to a VFX house. This would break the relationship between time code and frame number. Also, some productions don't like to preselect the takes because it means additional negative handling. Scanning by frame time count also implies that the contents of the reel are known in advance. Bear in mind that the jobs are scanned even if the wrong reel is loaded. Without the additional knowledge of key code information, the only way to check that the correct frames were scanned is by visual comparison to the video material that was used for editing.

The ARRISCAN supports import of time code with 24, 25, or 30 fps. In any case a one to one relationship between film and video frames is assumed.

4.2.2 Key Code-Based Workflow

The *key code* (page 266) based workflow is common in the United States. The important steps are described below.

- Single camera rolls or combined rolls are used in telecine for video dailies but only selected takes (circle takes) are transferred.
- Transfer is done in NTSC video. To convert from 24 fps to 30 fps the so-called 3:2 pull down is used. The telecine is equipped with a key code reader and the relation between video time code and key code is kept in a FLEX file.
- The important consequence of the points above is that the dailies tape is not a frame-by-frame copy of the film reel. Therefore, the time code cannot be used to locate the material used in the edited program.
- After editing a pull list is generated. It contains the start and last key code of each cut. The pull list is either created by the off-line editing system or an additional match-back application is used, which uses the FLEX files from with the video dailies.
- The roll is loaded into the film scanner and the frame line is set (if the information from the editing system is not perf accurate).
- The film scanner searches the start key code of each clip on the lab roll and generates DPX files containing the key code in the file header.
- The DI system uses an assemble list, perhaps in combination with an optical list. Conforming is done by looking for the DPX files containing the matching key code.

The advantage of this workflow is that it does not rely on any relation between video time code and frame numbers. Only the identification that is printed onto the film itself is used. However, this makes it necessary to have a reliable key code reader on the telecine.

4.2.3 A Combination of Both

It is possible to combine elements of the time code and key code based workflow.

Option 1: Use time code for identification and key code for control

We assume the dailies are created from entire lab rolls with a PAL transfer. A key code logger was used as well.

Import time code and key code from a pull list and set the priority to time code. Consolidation of the clips is done by time code, i.e. frame number. Each job has a source time code, a start frame, and a key code. Execute the jobs in the ARRISCAN by start frame. The start key code of each clip read from the negative is logged in the database. Also, the DPX files carry the same information. Now, you can compare those key codes with the key codes imported from the pull list and look for any mismatches.

Option 2: Use key code for identification and time code for conforming

Some DI systems may not be able to conform by key code. In the offline-editing system generate an EDL and a pull list. Load the pull list in the ARRISCAN with key code priority. Each job has a source time code and a key code but no start frame. Execute the jobs in the ARRISCAN by key code. The DPX files contain the source time code, which is used by the DI system to match the frames to the EDL. The variable SOURCEFRAME allows you to build file names based on the original source time code.

4.3 Job Scripts

The ARRISCAN supports automatic execution of scripts at various points during job processing. Scripts are a very powerful tool that can be used for a number of things such as:

- Automatically post-processing scanned images.
- Copying images after scanning.
- Sending email messages to the operator.

There are four points at which scripts can be invoked during job processing:

Start of Job (on-start)	Invokes the script at the beginning of the job, that is, before the acquisition of the first frame.
End of Job (on-end)	Invokes the script at the end of the job, that is, after the last image file is written.
End of Frame (on-frame)	Invokes the script after the image files for the frame have been written.
Error (on-error)	Invokes the script when an error occurs.

Any script that can be executed from a UNIX command line is supported. An example of a popular scripting language is Perl, but any other command interpreter can be used. The command line for each of the four scripts is specified in the job record of the ARRISCAN database. These fields can be edited in the Job Editor as described in *Specifying Job Scripts* (page 100). Note that the path definitions for scripts do not use the mount point setting. You need to specify a complete absolute path for each script.

The ARRISCAN daemon quits job processing if a script returns a non-zero exit code. If an error occurs, job processing always quits after running the on-error script, regardless of the script's return code.

If the on-frame script is active, the ARRISCAN GUI displays the script load to the right of the save queue load during job processing. The script load measures the execution time of the on-frame script relative to the current job's frame rate. This measurement is not perfect, since there is additional overhead that is not taken into account. In practice, the frame rate may already begin to drop at figures around 50%. This should be checked in test runs.

An on-frame script can affect the performance of the scanner, especially when running at high frame rates (with the SpeedPack option installed). If possible, the use of on-frame scripts should be avoided. Use an on-end script instead.

When the ARRISCAN daemon runs any of the job scripts, it sets a number of environment variables that are accessible from inside the scripts. The information that is passed in the environment variables is intended to cover most users' requirements without the need to access the database from the scripts. It is always possible to acquire the complete job information from the database by means of the ASJOBID variable by using `mysql` and parsing the output.

ASHIRESPATH	Path to the hi-res image file (incl. mount point). This is equivalent to the hi-res path defined in the job definition with the mount point path prepended and all job variables ('%JOBNAME%' etc) expanded. The file name is as defined in the job (including formatting specification such as '%04d').
ASFIRSTNUM	Initial frame count as defined in job.
ASNUMFRAMES	Number of frames to be scanned for the job.
ASJOBNAME	Name of the job.
ASUSERDATA	User data (as used for the header of the job log file).
ASJOBID	Database primary key of the job definition (for accessing the complete job definition information).
ASJOBNUM	Position of job within reel.
ASNUMJOBS	Total number of jobs selected for scanning for this job's reel.
ASEVENT	Type of script event ('start', 'end', 'error', or 'frame'). This is intended to facilitate the use of a single script for all types of events.

For the on-frame script, the following variables are additionally available:

ASHIRESFILE	Similar to ASHIRESPATH, but with expanded file name (formatting string replaced with formatted frame number and file extension added). This is a direct path to the hi-res file that was written to disk.
ASFRAMENUM	Number of the frame as used to build the file name.
ASKEYCODE	Key code at the frame position as a string. The key code is in count/perfs or in feet/frame format depending on the data format setting (i.e. the key code has the same format as in the DPX file header). If no key code was detected, the variable contains the string "XX 00 0000-0000+00".
ASKEYCODESTATUS	Key code detection status. See <i>Key Code Detection Status Values</i> (page 250).
ASTIMECODE	Time code of the frame formatted as a string

For the on-error script, the following variables are additionally available:

ASERRORMSG	The error message
ASFRAMENUM	Number of the frame as used to build the file name. If the error did not correspond to a particular file, this number is set to -1.

In addition, user-defined variables can be specified as semicolon-separated pairs. Again, these can be edited in the Job Editor. For example, you can set two environment variables, `USERONE` and `USERTWO`, as follows:

```
USERONE=1; USERTWO=this is text
```

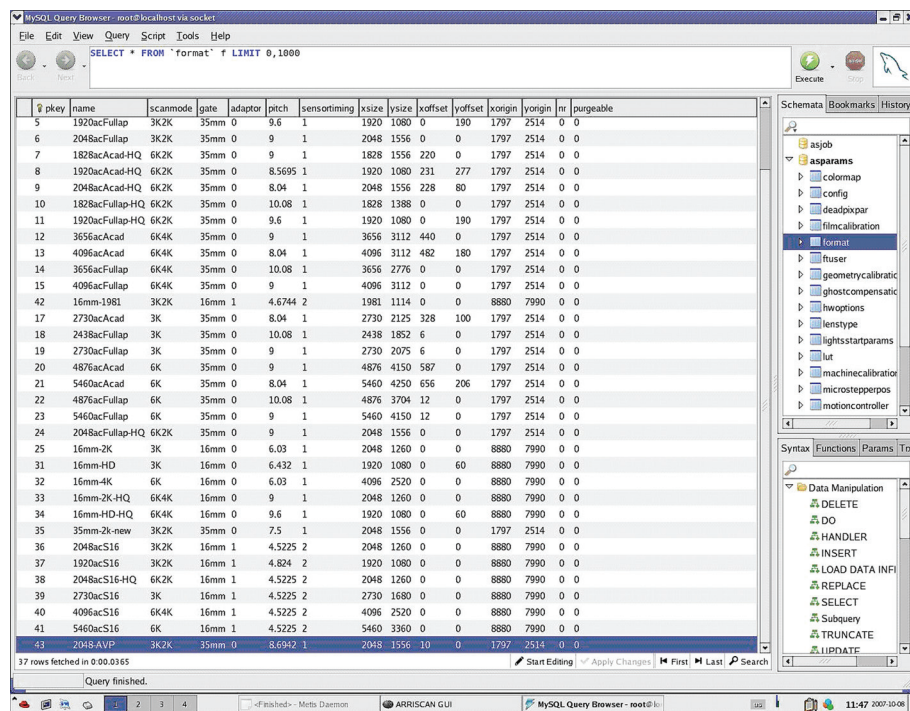
As in the example above, the last semicolon may be omitted.

4.4 Creating Custom Pitches

You can create custom pitches by adding new records in the asparams database.

To create a custom pitch, perform the following steps:

1. Kill all running Marvin and Daemond.
2. In the KDE GUI, click the K-Symbol on the bottom left corner, and select the Query Browser.
3. Click **Connect** without entering a password.



1. In the MySQL Query Browser, open the Schemata tab.
 2. Select the **asparams** database, and then double-click the **format** table.
- In the upper command area, you see an entry `select * from asparams.format`.
3. Click  to execute the query.
 4. To insert a new record, click **start editing**, and enter the new values for the record:

name, for example 2048-AVP

scanmode, for example 3k2k

gate, for example 35mm

adaptor, for example 0

pitch, for example 8.6942

sensortiming, for example 1

xsize, for example 2048

ysize, for example 1556

xoffset, leave empty if unknown

yoffset, leave empty if unknown

xorigin, set to 1779

yorigin , set to 2514

nr, set to 0

purgeable, set to 0

5. Click **Apply Changes** to save your settings.

The new custom pitch is available and you can exit the Query Browser.

6. Restart Daemond and Marvin.
7. Do a machine calibration on the new generated pitch size.
8. You find the new geometry in the Acquisition tab. Click Resolution, select the new generated entry and save it as custom geometry.

Calculating the pitch size

The pitch size is calculated by dividing the horizontal size of the scan template (x-size) through the number of pixels you try to achieve multiplied with the downsampling coefficient.

$$\text{Pitch size} = (x\text{-size} / x\text{-pix}) * \text{downsampling coefficient}$$

The downsampling factor is only relevant when scanning 35 mm film and 16 mm film with adaptor lenses.

Use the following downsampling coefficients:

Sampling Ratio	Coefficient
6k	2
6k - 4k	1,5
6k - 2k	0,75
3k	1,00
3k - 2k	0,75

Example: Calculating your own pitch size for 35 mm material:

Resolution: 3k-2k fullap, x-size for 35 mm = 24576 μm , x-pix = 2048

Pitch Size = $(24576 \mu\text{m} / 2048) * 0,75 = 9 \mu\text{m}$

Example: Calculating your own pitch size for 16 mm material with no adaptor lens:

x-size for 16 mm = 1234,944 μm , x-pix = 2048

Pitch Size = $(12349,44 \mu\text{m} / 2048) * 1 = 6,03 \mu\text{m}$

Example: Calculating your own pitch size for 16 mm material with adaptor lens:

Resolution: 3k - 2k, x-size for 16 mm = 1234,944 μm , x-pix = 2048

Pitch Size = $(12349,44 \mu\text{m} / 2048) * 0,75 = 4,5225 \mu\text{m}$

4.5 Automatic Selection of Film Calibration

The ARRISCAN treats film calibrations as film type specific. This makes it possible to select film calibrations automatically during job processing. To make this work, there must be a film calibration defined for each film stock that is likely to be encountered during scanning. When defining the job settings, the film calibration must be set to 'Auto'. Then, at the beginning of each job, the ARRISCAN determines the film type from the key code data.

In order to enable a film calibration for automatic selection, it must be assigned to a project. This can be done in the *Film Calibration Panel* (page 131). There are three possibilities:

- You can select a project. The calibration is then assigned to this project and is not used in any other project.
- You can select 'All' to make the calibration available to all projects.
- You can select 'None' to disable automatic selection for a calibration. When 'None' is selected, the calibration will never be used by any job whose calibration is set to 'Auto'.

Generally, a film calibration should be assigned to a specific project. This avoids conflicts during job processing. The GUI warns if you try to save a film calibration for a project that already has a calibration for the same film type assigned.

During job processing, film calibrations are selected according to the following scheme:

- First, the ARRISCAN tries to find a film calibration for the current film type that is assigned to the job's project.
- If it cannot find a calibration for the film type in the project, it checks the calibrations that are set to 'All'.
- If it still cannot find a calibration, an error is logged, and the job is not scanned. Job processing continues with the next job.
- If for some reason there are two film calibrations defined for the same film type within the project, the first calibration that was found is used. Note that this may or may not produce the desired results. A warning is logged in this case.

The film calibration that is selected during job processing is logged in the Job Log, and also in the job itself. Warnings and errors are also logged in this way. The information can be viewed after the job has been processed using the *Job Info Browser* (page 103).

4.6 Proxy Scanning

Sometimes it is desirable to save a proxy at a lower resolution at the same time as the high-resolution frame. For instance, this can speed up the workflow because proxies do not have to be generated in the grading suite. The ARRISCAN can produce pixel-accurate high quality proxies that have the same sharpness appearance as the high-resolution scans. Proxies can be saved at resolutions up to 1k. The ARRISCAN allows you to apply letter- or pillarboxing in order to pre-format proxies for playout to video tape. Note that the proxy geometry definition has its own sharpening setting for the proxy filter. The proxy is not affected by the filter settings in the *Film Calibration Panel* (page 131). To arrive at a filter setting that makes the proxy appear similar to the high-resolution scan, conduct a test where the proxy is viewed on its final output device (such as a HD monitor or a digital projector).

The proxy geometry is part of the frame geometry and is specified in the *Proxy Geometry Dialog* (page 128) of the *Geometry Panel* (page 124). The proxy file format is specified as part of the output data format definition in the *Data Format Panel* (page 137). Proxies do not have to be saved in the same file format as the high-resolution files. However, when both proxy and high-resolution file are saved to a logarithmic Cineon or DPX file, both have to use the same Cineon conversion parameters.

When a proxy is selected in the data format setting, a destination path must be specified in the section *File Setup* (page 96) of the *Job Settings* (page 93).

The ARRISCAN may be slowed down if proxies are specified. This depends on the scanning parameters and the available processing resources. Newer systems with fast processors in the host computers can generate proxies even at frame rates up to 8 fps.

5 **astools**

The astools package is a comprehensive collection of scripts for managing jobs in the job database of the ARRISCAN.

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5.1 Introduction

In addition to manually editing jobs in the job editor of the ARRISCAN GUI, there are two ways of getting job information into the database: through the XML job file importer, or through import filters.

Job files use an XML format and describe all parameters of each scan job. This means they do not only contain the scan reel, start position, and number of frames, but also specify the output geometry, filmcalibration, and other settings. The jobs can be processed immediately after they are imported. More details can be found in the *ARRISCAN Job File description* (page 196).

Import filters read scan lists in tabulated format or EDLs (edit decision lists). Those formats do not contain any information about the scan resolution or the film calibration. Therefore, the imported jobs are incomplete and need to be edited in the job editor before they can be processed by the ARRISCAN. This is discussed further in the section on *import filters* (page 177).

The astools job importers are command-line scripts. The ARRISCAN GUI also provides a graphical user interface that generates the commands, which is described in *EDL Import* (page 105) in the software reference.

5.2 Import Filter

This section describes the astools import filters as of version 1.1, released on June-09 2006.

Version 1.2, updated on October-16 2006

5.2.1 Introduction

The import scripts provide a user extensible mechanism for importing scan lists in various formats into the job queue of the ARRISCAN. The scripts are placed in the directory `/usr/arri/bin/importfilter`. Within Marvin you can select one or more scan files and the import options. Direct execution of the scripts in the command shell is possible as well. The script reads one or more scan lists and adds new jobs into the job database. The new jobs have the status "incomplete" because the output geometry, film calibration, and other scan settings need to be specified before the jobs can be executed.

Most of the functionality of the import scripts is implemented in Perl modules. Therefore, users with some knowledge of Perl can easily program their own import filters.

For the purposes of this document, the following terms are used:

- A *clip* is a contiguous sequence of frames on a scan reel.
- A *job* is a sequence of frames to be scanned. In many cases there is a one to one relation between jobs and clips. However, overlapping clips may be combined into a single job, and duplicate clips may not be scanned at all.

Input formats

The import filter `astabbedimport.pl` (*man page* (page 223)) reads scan lists in tabulated format.

SCANREEL	STARTFRAME	FRAMES	TAKE
NR001	1500	100	112/1
NR001	15000	250	115/7 A
NR002	97500	100	64/7 B
NR001	15500	300	115/7 A

The import filter `asedlimport.pl` (*man page* (page 226)) reads EDLs in CMX3600 format (see *EDL* (page 185)).

```

TITLE:  ARRISCANTEST 01
001  NR001      V      C      00:01:00:00 00:01:04:00 00:00:00:00 00:00:04:00
* FROM CLIP NAME: 112/1
002  NR001      V      C      00:10:00:00 00:10:10:00 00:00:04:00 00:00:14:00
* FROM CLIP NAME: 115/7 A
003  NR002      V      C      01:05:00:00 01:05:04:00 00:00:14:00 00:00:18:00
* FROM CLIP NAME: 64/7 B
004  NR001      V      C      00:10:20:00 00:10:32:00 00:00:18:00 00:00:30:00
* FROM CLIP NAME: 115/7 A

```

The import filter `aspullimport.pl` (*man page* (page 228)) reads pull lists (see *Pull Lists* (page 188)).

Event	KNStart	KNEnd	TCStart	TCEnd	Labroll	Clip
1	EV 75 1812-6083+13	6084+06	01:00:00:13	01:00:00:22	LAB001	01/1 01/1
4	EV 75 1812-6098+10	6102+07	01:00:10:00	01:00:12:11	LAB001	01/3 01/3
5	EV 75 1812-6102+13	6105+14	01:00:12:17	01:00:14:16	LAB001	01/4 01/4
6	EV 75 1812-6108+17	6111+16	01:00:16:17	01:00:18:14	LAB001	01/5 01/5
7	EV 75 1812-6118+01	6115+00	01:00:22:11	01:00:20:12	LAB001	01/6 01/6
8	EV 75 1812-6124+05	6121+04	01:00:26:11	01:00:24:12	LAB001	01/7 01/7
10	EV 75 1812-6130+04	6133+11	01:00:30:06	01:00:32:11	LAB001	01/8 01/8
2	EV 75 1812-6208+12	6212+09	01:00:44:12	01:00:46:23	LAB001	02/1 02/1

It also reads cut lists (see *Cut Lists* (page 190)).

Footage	Duration	First/Last Key	First/Last Aux Ink	Clip Name
1.	0+00 11+15	12+00 (NO EDGE NUMBERS)		CountDown.pic
2.	12+00 63+15	52+00 (NO EDGE NUMBERS)		043-h1_001_v25_1-874.mov
3.	64+00 76+07	12+08 (NO EDGE NUMBERS)		043_HL_002_V3.mov
4.	76+08 86+10	10+03 EH 01 8241-5547+13 EH 01 8241-5557+15		X44BB-4c
5.	86+11 96+04	9+10 EV 19 2765-5889+08 EV 19 2765-5899+01		044_h1_003_v7_6
6.	96+05 100+10	4+06 EH 23 7674-8194+01 EH 23 7674-8198+06		44H-9
7.	100+11 104+10	4+00 EH 02 7347-5356+13 EH 02 7347-5360+12		44J-4

5.2.2 Name Processing

When importing jobs into the queue, file names and directory paths can be automatically constructed based on information in the scan list. In the ARRISCAN import mechanism this is controlled by naming templates. When a scan list is imported a set of variables is defined for each clip. These variables have names such as STARTFRAME, SCANREEL, PROJECT and so on. Which variables exist depends on the import filter and the kind of scan list. The naming template defines rules how new variables are built from the pre-defined ones. Each naming template must define the variables JOBNAME and HIRES PATH, otherwise, the job cannot be added to the queue because a job needs to have a name and a directory path where the images are stored.

The ARRISCAN software comes with three naming templates. Importing the tabulated scan list from the previous section with those templates is shown in the following examples.

Example 1

This naming template puts all frames from one scan reel into one directory. Therefore it is necessary that each clip starts with the absolute reel frame number. The job name is only used for reference in the queue list but has to be defined nonetheless.

```
$JOBNAME = sprintf('${SCANREEL}_%06d', ${STARTFRAME})
$HIRES PATH = ${PROJECT}/scans/${SCANREEL}/%RESOLUTION%/ %06d
$NRFIRSTFRAME = ${STARTFRAME}
```

The scans of the 4 jobs are stored under this directory paths

```
4seasons/scans/nr1/%RESOLUTION%/4seasons/scans/nr2/%RESOLUTION%/
```

The %RESOLUTION% placeholder is replaced by Marvin with the actual image size in the form x. Marvin also adds the filename extension based on the selected file format. Assuming you are scanning 2k files in DPX files, the file paths are

```
4seasons/scans/nr1/2048x1556/001500.dpx
4seasons/scans/nr1/2048x1556/001501.dpx
...
4seasons/scans/nr1/2048x1556/015000.dpx
4seasons/scans/nr1/2048x1556/015001.dpx
...
4seasons/scans/nr2/2048x1556/097500.dpx
4seasons/scans/nr2/2048x1556/097501.dpx
...
```

If all frames of a scan reel are placed in the same directory it is imperative to use the options --nodupes and --merge.

Example 2

The second example puts each clip in its own directory, which is defined as

```
$JOBNAME = sprintf('${SCANREEL}_%06d-%06d', ${STARTFRAME},  
${STARTFRAME}+${FRAMES}-1)  
$HIRESPATH = ${PROJECT}/scans/${JOBNAME}/%RESOLUTION%/06d
```

When you process the same scan lists with this naming template, you get the following job directories

```
4seasons/scans/nr1_001500-001599/%RESOLUTION%/
4seasons/scans/nr1_015000-015249/%RESOLUTION%/
4seasons/scans/nr1_015500-015799/%RESOLUTION%/
4seasons/scans/nr2_097500-097599/%RESOLUTION%/
```

Example 3

The last example uses the scene/take name for the directory and file names.

```
$SHOT = sreplace(lc('${TAKE}'), ' ', '', '/', '$', '', '/', '_', '-')  
$JOBNAME = sprintf('${SHOT}_%02d', ${SHOTNUM})  
$HIRESPATH = ${PROJECT}/scans/${JOBNAME}/%RESOLUTION%/${JOBNAME}.%06d
```

With this naming template the hirespath in the jobs is

```
4seasons/scans/112_1_01/%RESOLUTION%/112_1_01.%06d
4seasons/scans/115_7a_01/%RESOLUTION%/115_7a_01.%06d
4seasons/scans/115_7a_02/%RESOLUTION%/115_7a_02.%06d
4seasons/scans/64_7b_01/%RESOLUTION%/64_7b_01.%06d
```

Note how the shot number for the second part of take 115/7A is increased. For every value of \$SHOT in a project, the ARRISCAN generates a unique shot number by incrementing a counter starting at one. This number is maintained across invocations of the software.

5.2.2.1 Syntax Reference

Variables

The syntax for the naming templates is simple. Each line defines a variable in the form `$VARIABLE = expression`. All variables in the expression must be defined at this point. In order to unambiguously separate the variable names from literal strings, the variables are written within curly braces. Simple concatenation of variables and/or literals can be written straight forward.

The variable `$SHOT` has a special meaning. For each distinct value of `$SHOT` exists a counter, which is incremented when that value is assigned. This counter is transferred into the variable `$SHOTNUM`. This comes in handy when the scene/take names are used as directory names. The counter values are maintained separately for each project across invocations of the import filter.

Which variables are pre-defined depends on the importer and the loaded scan list. Please read the man page for the importer you want to use.

This is a list of variables that are or can be defined to set job parameters. *Mandatory* means that the naming template has to define a value for this variable. *Predefined* means that the variable is already set by the list importer. Other variables may be pre-defined depending on the type of importer and list. The variable `TAKE`, for example, is set when an EDL is imported that contains "FROM CLIP" comments.

The naming template should not alter the predefined variables. It is possible but may have unexpected results since the merging (see next chapter) of jobs is done before the naming processing.

JOBNAME	Mandatory	Name of the job as it appears in the job list
FRAMES	Predefined	The number of frames to scan
HIRESPATH	Mandatory	Path for the hires images
PROXYPATH	Optional	Path for the proxy images
MATTEPATH	Optional	Path for the infrared defect matte
ORIGINALPATH	Optional	Path for the unprocessed hires scans
LOGPATH	Optional	Path for the log file
STARTFRAME	Predefined	Start of the job relative to the reference frame
SOURCEFRAME	Predefined	Source time code converted to number
SCANREEL	Predefined	Name of the scan reel as it appears in the job list
TIMECODE	Predefined	Source time code written to DPX header. Can also define the STARTFRAME.

TCBASE	Optional	Speed (24.0 or 25.0) of the time code
KEYCODE	Predefined	Key code specification. Can replace the STARTFRAME.
GAUGE	Optional	Film gauge and format
SHOT	Optional	Can be used to increment unique shot number
SHOTNUM	Predefined	Is incremented every time SHOT is set
PROGRAM	Predefined	The name of the imported program file w/o extension
TITLE	Predefined	The title line of an EDL
PROJECT	Predefined	Project to which the job belongs

Additional notes

JOBNAME

The name is not needed for a job to work. Even in the ARRISCAN GUI you can create a job without a name. Having dozens or even hundreds of unnamed jobs, however, makes it impossible to work with the ARRISCAN's job editor. With scan lists that contain no individual names for the job most people use a combination of reel name and start frame.

STARTFRAME and SOURCEFRAME

When jobs are imported with time code priority, the two variables have the same value, which is the source time code converted to a frame number. Jobs that are imported with key code priority have no STARTFRAME, but SOURCEFRAME is set if a source time code exists.

SCANREEL

A name (may be a number) of the scan reel is needed if jobs are executed by frame number or timecode. For key code based scanning it is not mandatory but again the ARRISCAN job editor needs something to display.

IRPATH and ORIGINALPATH

These variables are used in combination with Digital ICE.

TCBASE and GAUGE

Normally, these variables are set through the importer options (--tcbase and --gauge). But an importer may choose to override those settings and read the values from the scan list itself.

SHOT and SHOTNUM

For every value of \$SHOT in a project, the ARRISCAN generates a unique shot number by incrementing a counter starting at one. This number is maintained across invocations of the software. Deleting the project resets the counter.

PROJECT

This variable is set by the importer option --project.

Concatenation of strings

Concatenation is achieved by simply writing literal strings and variable names together. Variable names are placed in curly braces.

`${PROJECT}/scans/${JOBNAME}`, for example, concatenates the contents of the variables \$PROJECT and \$JOBNAME and the literal string '/scans/'.

Formatting of numbers

Numbers are formatted with the `sprintf` function. The syntax is `sprintf('formatstring', arg1, ...)`. The format string is returned while '%' directives are replaced with the further arguments. The most used '%' directives are

<code>%s</code>	Print a string.
<code>%d</code>	Print an integer number.
<code>%<n>d</code>	Print an integer number left padded with spaces to <n> characters.
<code>%0<n>d</code>	Print an integer number left padded with zeros to <n> digits.

For each '%' directive there must be an argument that evaluates to a compatible value. The arguments can be literal strings, variables, or arithmetic expressions. The format string and literal strings must be quoted with single ticks.

String replacement

The utility function `sreplace` is used to replace occurrences of substrings and characters in strings. The syntax is `sreplace(string, pattern1, replacement1, ...)`. If <pattern1> occurs in <string> it is replaced by <replacement1>. You can specify several pairs of patterns and replacements. The patterns are given as regular expressions. While they can be quite tricky to use, there are a lot of useful and simple applications.

<code>xyz</code>	Matches the substring "xyz".
<code>xyz\$</code>	Matches the substring "xyz" at the end of the string.

<code>^xyz</code>	Matches the substring "xyz" at the begin of the string.
<code>x. .</code>	Matches any three letters when the first one is a "x".
<code>x+</code>	Matches any substring consisting of one or more "x".

Options for Import Filters

There are three common options for all import filters that define how new clips are added to the queue.

`--nodupes`

With this option, the import filter will import no clips that are already included in other clips or existing jobs. Note that it may make a difference whether you import several scan lists together or separately.

`--merge`

Valid values are `none`, which is the default, `list`, or `db`. With `--merge list` overlapping clips in the scan list(s) will be merged into one job. If the importer is even to merge new clips into existing jobs, use `--merge db`. Naturally, only jobs not yet executed are modified.

`--priority`

Valid values are "timecode" or "keycode". This option rules how the import filter is to handle lists that contain both, time code and key code.

With `--priority timecode` the import filter converts the time code into a start frame. A key code is imported as well and it is adjusted for handles. Sorting and comparison of clips (see `--nodupes` and `--merge`) will be done by reel name and start frame.

With `--priority keycode` sorting and comparison of clips is done by prefix, count, and offset. A time code is imported as well and it is adjusted for handles. No start frame is generated, though.

The EDL import filter ignores this option; it works with time code only.

A list of examples of how the options for the import filter control the import of scan jobs.

5.2.3 List Reference

This section describes the formats that are supported by the import filter. In general, edit points can be specified either as time code or key code. Both methods are supported by the ARRISCAN.

5.2.3.1 EDL

Edit Decision Lists have been used in video editing for decades. They were originally developed to control video editing hardware. The format is quite simple and offers limited possibilities only. This simplicity, however, is the reason why EDLs are supported by almost every application in editing, color timing, and mastering.

The import filter `asedlimport.pl` (man page) reads EDL in CMX3600 format. This EDL was generated with Avid® Adrenaline.

```
TITLE:   R01V1
001  FAT001  V    C           01:00:00:13 01:00:00:23 01:00:00:00 01:00:00:10
* FROM CLIP NAME: 01/1
002  FAT001  V    C           01:00:44:12 01:00:46:00 01:00:00:10 01:00:01:23
* FROM CLIP NAME: 02/1
003  FAT001  V    C           01:00:46:00 01:00:46:00 01:00:01:23 01:00:01:23
003  FAT001  V    D   024 01:00:10:00 01:00:12:12 01:00:01:23 01:00:04:10
* FILM, FILM DISSOLVE
* FROM CLIP NAME: 02/1
* TO CLIP NAME: 01/3
004  FAT001  V    C           01:00:12:17 01:00:14:17 01:00:04:10 01:00:08:10
M2   FAT001           012.5           01:00:12:17
* FROM CLIP NAME: 01/4
005  FAT001  V    C           01:00:16:17 01:00:18:17 01:00:08:10 01:00:09:10
M2   FAT001           050.0           01:00:16:17
* FROM CLIP NAME: 01/5
006  FAT001  V    C           01:00:22:11 01:00:20:11 01:00:09:10 01:00:11:10
M2   FAT001          -025.0           01:00:22:11
* FROM CLIP NAME: 01/6
007  FAT001  V    C           01:00:26:11 01:00:24:17 01:00:11:10 01:00:14:23
M2   FAT001          -012.5           01:00:26:11
* FROM CLIP NAME: 01/7
008  FAT001  V    C           01:00:24:17 01:00:24:17 01:00:14:23 01:00:14:23
008  FAT001  V    D   012 01:00:30:06 01:00:28:00 01:00:14:23 01:00:19:10
M2   FAT001          -012.5           01:00:24:17
M2   FAT001           012.5           01:00:30:06
* FILM, FILM DISSOLVE
* FROM CLIP NAME: 01/7
* TO CLIP NAME: 01/8
```

Note that the EDL contains several motion events (M2 events), dissolves, and combinations of both.

When the EDL is imported and processed with the naming template from example 3 in *Name Processing* (page 179), the following job list is created:

JOBNAME	SCANREEL	STARTFRAME	TIMECODE	FRAMES
01_1_01	FAT001	90013	01:00:00:13	10
01_3_01	FAT001	90250	01:00:10:00	62
01_4_01	FAT001	90317	01:00:12:17	50
01_5_01	FAT001	90417	01:00:16:17	49
01_6_01	FAT001	90512	01:00:20:12	50
01_7_01	FAT001	90612	01:00:24:12	50
01_8_01	FAT001	90756	01:00:30:06	56
02_1_01	FAT001	91112	01:00:44:12	62

EDL Optimization

For the previous EDL, optimization was turned on. Without optimization, Avid® Adrenaline produces an EDL with two more events.

```

TITLE:  R01V1 NO OPTIMAZATION
001  FAT001  V  C  01:00:00:13 01:00:00:23 01:00:00:00 01:00:00:10
* FROM CLIP NAME: 01/1
002  FAT001  V  C  01:00:44:12 01:00:46:00 01:00:00:10 01:00:01:23
* FROM CLIP NAME: 02/1
003  FAT001  V  C  01:00:46:00 01:00:46:00 01:00:01:23 01:00:01:23
003  FAT001  V  D  024 01:00:10:00 01:00:10:24 01:00:01:23 01:00:02:22
* FILM, FILM DISSOLVE
* FROM CLIP NAME: 02/1
* TO CLIP NAME: 01/3
004  FAT001  V  C  01:00:10:24 01:00:12:12 01:00:02:22 01:00:04:10
* FROM CLIP NAME: 01/3
005  FAT001  V  C  01:00:12:17 01:00:14:17 01:00:04:10 01:00:08:10
M2  FAT001  012.5 01:00:12:17
* FROM CLIP NAME: 01/4
006  FAT001  V  C  01:00:16:12 01:00:18:12 01:00:08:10 01:00:09:10
M2  FAT001  050.0 01:00:16:12
* FROM CLIP NAME: 01/5
007  FAT001  V  C  01:00:22:11 01:00:20:11 01:00:09:10 01:00:11:10
M2  FAT001  -025.0 01:00:22:11
* FROM CLIP NAME: 01/6
008  FAT001  V  C  01:00:26:11 01:00:24:17 01:00:11:10 01:00:14:23
M2  FAT001  -012.5 01:00:26:11
* FROM CLIP NAME: 01/7
009  FAT001  V  C  01:00:24:17 01:00:24:17 01:00:14:23 01:00:14:23
009  FAT001  V  D  012 01:00:30:06 01:00:30:00 01:00:14:23 01:00:15:10
M2  FAT001  -012.5 01:00:24:17
M2  FAT001  012.5 01:00:30:06
* FILM, FILM DISSOLVE
* FROM CLIP NAME: 01/7
* TO CLIP NAME: 01/8
010  FAT001  V  C  01:00:30:12 01:00:32:12 01:00:15:10 01:00:19:10
M2  FAT001  012.5 01:00:30:12
* FROM CLIP NAME: 01/8

```

Accordingly, the EDL importer would generate two more jobs.

JOBNAME	SCANREEL	STARTFRAMES	FRAMES
01_1_01	FAT001	90013	10
01_3_01	FAT001	90250	24
01_3_02	FAT001	90274	38
01_4_01	FAT001	90317	50
01_5_01	FAT001	90412	49
01_6_01	FAT001	90512	50
01_7_01	FAT001	90612	50
01_8_01	FAT001	90756	6
01_8_02	FAT001	90762	50
02_1_01	FAT001	91112	62

However, when the option "--merge list" (see *Options for Import Filters* (page 184)) is used, the clips are merged together and the same job list as with the optimized EDL is generated.

EDL Parser Rules

This information is for users who need to know exactly how the EDL import filter calculates the source length of clips.

- Take the source-in time code as first frame and the record length as length of the event.
- Add frames for dissolves.
- Calculate speed from frame rate rounded to one digit.
- The clip length is calculated as $\text{FRAMES} = 1 + \text{floor}(\text{abs}(\text{speed}) * (\text{eventLength}-1))$
- If ($\text{speed} > 0$): $\text{STARTFRAME} = \text{firstFrame}$
If ($\text{speed} < 0$): $\text{STARTFRAME} = \text{firstFrame} - \text{FRAMES}$

Note that the EDL importer accounts for motion events but scanning is always done in "speed 1.0". For a one second double speed event like in the EDL above (event 005) 49 frames are scanned (1, 3, ..., 49 gives a sequence of 25 frames). Also, backward motion events are scanned forward.

Currently, we support only EDLs where one video frame corresponds to one film frame (i.e. 24, 25, or 30 fps). We do not have a match back feature for 3:2 pull-down transfers.

5.2.3.2 Key Code Lists

Jobs for key code based scanning can be created automatically from lists generated by the editing software. The ARRISCAN supports cut lists and pull lists. Both of these formats can be generated by the Avid® FilmScribe™ tool. Of the two, the pull list format is recommended because it is much better suited as a basis for generating scan jobs. In addition, FilmScribe™ has a pull list template designed especially for film scanners.

Pull Lists

A pull list is a collection of all the clips that are used in a program. It does not show the order of the clips. In traditional film mastering, two kinds of pull lists are created: assemble pull lists, and optical pull lists. Using the Avid® FilmScribe™ utility we have created pull lists for our example program. The listings below may be line-wrapped.

Assemble Pull List

Event	KNStart	KNEnd	TCStart	TCEnd	Labroll	Clip
Scene/Take						
1	EV 75 1812-6083+13	6084+06	01:00:00:13	01:00:00:22	LAB001	01/1 01/1
2	Opt 1-0000+00	0006+03	Opticals	Opticals	Opt. #1	Opt 1/
3	Opt 2-0000+00	0006+03	Opticals	Opticals	Opt. #2	Opt 2/
4	Opt 3-0000+00	0001+08	Opticals	Opticals	Opt. #3	Opt 3/
5	Opt 4-0000+00	0003+01	Opticals	Opticals	Opt. #4	Opt 4/
6	Opt 5-0000+00	0012+07	Opticals	Opticals	Opt. #5	Opt 5/

Optical Pull List

Optical	KNStart	KNEnd	TCStart	TCEnd	Labroll	Clip
Scene/Take						
1	EV 75 1812-6100+02	6102+07	01:00:10:24	01:00:12:11	LAB001	01/3 01/3
2	EV 75 1812-6102+13	6105+14	01:00:12:17	01:00:14:16	LAB001	01/4 01/4
3	EV 75 1812-6108+17	6111+16	01:00:16:17	01:00:18:14	LAB001	01/5 01/5
4	EV 75 1812-6118+01	6115+00	01:00:22:11	01:00:20:12	LAB001	01/6 01/6
5	EV 75 1812-6121+09	6121+04	01:00:24:17	01:00:24:12	LAB001	01/7 01/7
5	EV 75 1812-6130+04	6130+09	01:00:30:06	01:00:30:11	LAB001	01/8 01/8
5	EV 75 1812-6124+05	6121+10	01:00:26:11	01:00:24:18	LAB001	01/7 01/7
5	EV 75 1812-6130+10	6133+11	01:00:30:12	01:00:32:11	LAB001	01/8 01/8
1	EV 75 1812-6208+12	6211+01	01:00:44:12	01:00:45:24	LAB001	02/1 02/1
1	EV 75 1812-6211+02	6212+09	01:00:46:00	01:00:46:23	LAB001	02/1 02/1
1	EV 75 1812-6098+10	6100+01	01:00:10:00	01:00:10:23	LAB001	01/3 01/3

Since most parts of the example program are dissolves and motion events, all but one clip are listed in the optical pull list.

The pull list does not contain any information about dissolves or motion events. It is not a description of the program - it just lists the source material that is needed for the program. Nevertheless, for the reversed shots, 1/6 and 1/7, the KNStart is after the KNEnd, a situation the pull list importer is aware of.

Note that in the pull list, the parts of a clip in and after a dissolve are listed separately. For example, take 2/1 appears twice at the bottom of the list, the first part runs from 01:00:44:12 to 45:24, the second part is from 01:00:46:00 to 46:23 (the last time code in pull lists is inclusive, while in an EDL it is exclusive). If you import both lists, you get the following jobs in the ARRISCAN job manager.

JOBNAME	TIMECODE	KEYCODE	FRAMES
01_1_01	01:00:00:13	EV 751812 6083+13	10
01_3_01	01:00:10:00	EV 751812 6098+10	24
01_3_02	01:00:10:24	EV 751812 6100+02	38
01_4_01	01:00:12:17	EV 751812 6102+13	50
01_5_01	01:00:16:17	EV 751812 6108+17	48
01_6_01	01:00:20:12	EV 751812 6115+00	50
01_7_01	01:00:24:12	EV 751812 6121+04	06
01_7_02	01:00:24:18	EV 751812 6121+10	44
01_8_01	01:00:30:06	EV 751812 6130+04	06
01_8_02	01:00:30:12	EV 751812 6130+10	50
02_1_01	01:00:44:12	EV 751812 6208+12	38
02_1_02	01:00:46:00	EV 751812 6211+02	24

You can avoid the split jobs by turning on the option "--merge list" (see *Options for Import Filters* (page 184)). Then, the pull list importer will concatenate clips at a match cut. The resulting job list looks like this.

JOBNAME	TIMECODE	KEYCODE	FRAMES
01_1_01	01:00:00:13	EV 751812 6083+13	10
01_3_01	01:00:10:00	EV 751812 6098+10	62
01_4_01	01:00:12:17	EV 751812 6102+13	50
01_5_01	01:00:16:17	EV 751812 6108+17	48
01_6_01	01:00:20:12	EV 751812 6115+00	50
01_7_01	01:00:24:12	EV 751812 6121+04	50
01_8_01	01:00:30:06	EV 751812 6130+04	56
02_1_01	01:00:44:12	EV 751812 6208+12	62

If you compare this list with the one obtained by importing the *EDL* (page 185), you see that all jobs have the same start timecode and the same length with the exception of the up-speeded take 1/5. Here, the pull list extracts one frame less.

In FilmScribe™ Version 23.5, Avid added an additional list template for digital film scanners. Lists created with this template contain all clips of the program. There is no separation in assemble and optical pull list.

Scanner Pull List

EventFtgStart Scene/Take	KNStart	KNEnd	TCStart	TCEnd	Labroll	Clip
Assemble_1 01/1	EV 75 1812-6083+13	6084+06	01:00:00:13	01:00:00:22	LAB001	01/1
Assemble_4 01/3	EV 75 1812-6098+10	6102+07	01:00:10:00	01:00:12:11	LAB001	01/3
Assemble_5 01/4	EV 75 1812-6102+13	6105+14	01:00:12:17	01:00:14:16	LAB001	01/4
Assemble_6 01/5	EV 75 1812-6108+17	6111+16	01:00:16:17	01:00:18:14	LAB001	01/5
Assemble_7 01/6	EV 75 1812-6118+01	6115+00	01:00:22:11	01:00:20:12	LAB001	01/6
Assemble_8 01/7	EV 75 1812-6124+05	6121+04	01:00:26:11	01:00:24:12	LAB001	01/7
Assemble_10 01/8	EV 75 1812-6130+04	6133+11	01:00:30:06	01:00:32:11	LAB001	01/8
Assemble_2 02/1	EV 75 1812-6208+12	6212+09	01:00:44:12	01:00:46:23	LAB001	02/1

Importing the scanner pull list results in the following jobs:

JOBNAME	TIMECODE	KEYCODE	FRAMES
01_1_01	01:00:00:13	EV 751812 6083+13	10
01_3_01	01:00:10:00	EV 751812 6098+10	62
01_4_01	01:00:12:17	EV 751812 6102+13	50
01_5_01	01:00:16:17	EV 751812 6108+17	48
01_6_01	01:00:20:12	EV 751812 6115+00	50
01_7_01	01:00:24:12	EV 751812 6121+04	50
01_8_01	01:00:30:06	EV 751812 6130+04	56
02_1_01	01:00:44:12	EV 751812 6208+12	62

All jobs are the same as the combined import of the two pull lists above.

Cut Lists

A cut list shows the order in which a sequence's clips, optical effects, and dissolves are assembled. It may consist of two parts, the assemble list and the optical list.

The main problem with cut lists is that they were never made to be a computer readable format. Traditionally, they are read by a negative cutter or a technician in an optical house. They can vary in format and composition.

The cut list below was generated with the Avid® FilmScribe™ utility from the same sequence that was used for the EDL example. As you see, the list consists of two parts: the assemble list, and the optical list. The optical list is printed in a very wide format that shows which clips have to be on the A-roll and which have to be on the B-roll. This is the method used in a film lab to create optical effects like dissolves. The layout is called columnar. The lines in the listing below may be wrapped and the list is shortened.


```
CUT                      6 events          LFOA:      485
Picture 1                0 dupes          total footage: 485
                        5 opticals        total time: 00:00:19:09
-----
-----
      Footage   Duration   First/Last Key   Start       Lab Roll   Cam Roll
Clip Name  Sc/Tk
1.          0          10   EV 75 1812-6083+13   01:00:00:13   LAB001      01/1
01/1        9              6084+06              01:00:00:22

2.          10          100   Opt 1-0000+00   OPTICAL #1
          109              0006+03

3.          110          100   Opt 2-0000+00   OPTICAL #2
          209              0006+03

4.          210          25   Opt 3-0000+00   OPTICAL #3
          234              0001+08

5.          235          50   Opt 4-0000+00   OPTICAL #4
          284              0003+01

6.          285          200   Opt 5-0000+00   OPTICAL #5
          484              0012+07

(end of Assemble List)
```

```

CUT                    5 optical units
Picture               all counts are inclusive (inside/inside)
                    all colors are specified as RGB
-----
-----

OPTICAL #1            Assemble Event #2            total length:      100

      Optical   Sequence
-----+-----+ +-- A side -----
-----+-----+ +-- B side -----
+
Start      Footage  Footage  Description      Length      First/Last Key
Cam Roll   Cam Roll  Clip Name  Sc/Tk      First/Last Key      Start
Cam Roll   Clip Name  Sc/Tk

      1.          0          10   Normal          38      EV 75 1812-6208+12
01:00:44:12          02/1          02/1
      37          47
01:00:45:24          6211+01

      2.          38          48   Dissolve          24      EV 75 1812-6211+02
01:00:46:00          02/1          02/1      EV 75 1812-6098+10      01:00:10:00
01/3          01/3
      61          71
01:00:46:23          6100+01      6212+09
                                01:00:10:23

      2.          62          72   Normal          38
EV 75 1812-6100+02      01:00:10:24      01/3      01/3
      99          109
6102+07          01:00:12:11

[...]

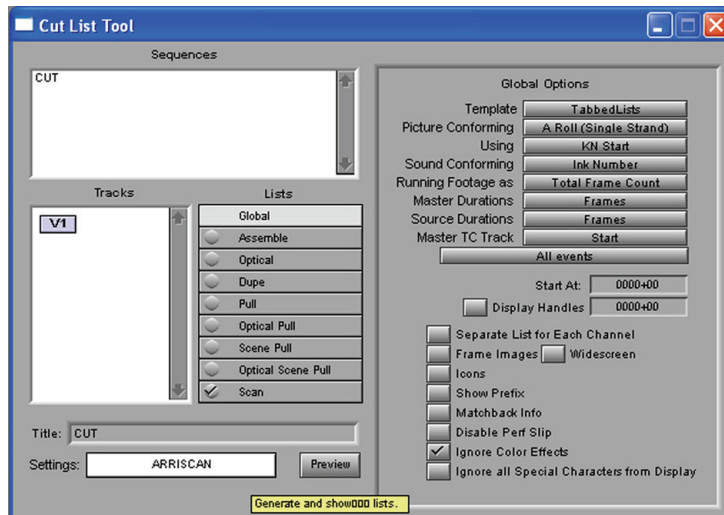
(end of Optical List)

```

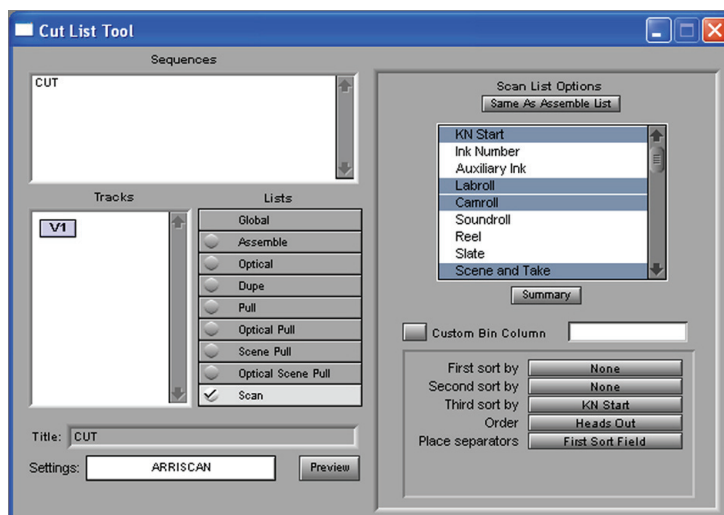
The ARRISCAN pull list importer can read assemble lists but it does not handle optical lists. A better way to import jobs into the ARRISCAN are *pull lists* (page 188).

FilmScribe

Based on discussions between Avid and ARRI, in FilmScribe™ Version 23.5 a new template for pull lists for digital film scanners was added. This template does not separate the clips into assemble and optical pull list. This is the most convenient way to create ARRISCAN key code scan lists for projects edited with an Avid® system.



When you create lists for the ARRISCAN make sure that you have selected "Tabbed Lists" as displayed in the image above. FilmScribe™ allows you select various columns for the pull lists. Almost certainly, you want to have the "KN Start" column in your list (see the screenshot below). You may select other columns like "Labroll" and map them to variables for the naming processing. This is explained in the *manual* page (page 228) for the pull list importer.



5.3 A Short XML Tutorial

The acronym XML stands for "Extended Markup Language". It was originally defined to write structured prose (i.e. a text which is structured in chapters, headers, paragraphs, and so on) but is used as a data format as well. With XML one can define a vocabulary describing the data. The elements of the vocabulary are marked with '<' and '>'. The basic syntax is:

```
<!--This is a comment -->
<!--Elements start with an opening tag -->
<lut>
<!--and end with a closing tag -->
</lut>
<!--Elements can contain other elements-->
<lut>
    <data> </data>
</lut>
<!--Elements can contain attributes -->
<lut name="lin2log">
</lut>
<!--Elements which have no other contents than attributes can be written in a
shorter form -->
<job name="177-5B_01" startframe="1000" frames="110"/>
```

XML itself defines only a few principal rules about the structure of the markups. There must be only one root element in a file. All elements have to be nested properly. That means there has to be a closing tag for each opening tag and an element cannot be closed before all nested elements are closed. An XML file that sticks to this rules is called "well formed".

```
<!--A well formed XML document -->
<?xml version="1.0" encoding="UTF-8"?>
<arriscan>
    <batch>
        <job name="177-5B_03" startframe="1200" frames="70"/>
        <job name="177-5B_03" startframe="1300" frames="65"
nrfirstframe="101"/>
    </batch></arriscan>

<!--This is not well formed the first job element is not closed -->
<?xml version="1.0" encoding="UTF-8"?>
<arriscan>
    <batch>
        <job name="177-5B_03" startframe="1200" frames="70">
        <job name="177-5B_03" startframe="1300" frames="65"
nrfirstframe="101"/>
    </batch>
</arriscan>
```

As you see XML itself defines not much. The vocabulary of a specific XML file is defined in an additional file, which is either a Document Type Definition (DTD) file or an XML Schema Definition (XSD) file. When such files are available an application like an XML editor can check whether a file is correct. This is called "validation" in XML terminology.

Currently, we provide a DTD in `/usr/arri/doc/arriscan.dtd`. While the job importer does not need this file, you can use it when you have to edit job files manually. Besides checking the correctness of the file, the editor may also support features like pop-up menus with a choice of valid elements and attributes.

If your editor supports DTD files, your XML job file should start with a DOCTYPE declaration.

```
<?xml version="1.0" encoding="UTF-8"?>  
<!DOCTYPE arriscan SYSTEM "path-to-file/arriscan.dtd">  
<arriscan>...
```

5.4 ARRISCAN Job File

This chapter describes the ARRISCAN job file format version 2.55, released 31-aug-2007.

5.4.1 Introduction

This section describes the XML format of the ARRISCAN job file. Job files are used to import a list of jobs into the database of the scanner.

Job files can include parameter records or they reference existing records in the database. Reference is by name, therefore the names of parameter records have to be unique within the file *and* the database. Names are case-sensitive. The import script *asjobimport.pl* (page 218) has an option to control how to resolve conflicts between the job file and existing parameter records.

A job file without jobs can be used to upload parameters into the ARRISCAN database.

The combination of jobs and parameter sets allows you to archive job files as self contained units that you can use at a later time for rescans or additional scanning. Even though parameter definitions may change in newer versions of the ARRISCAN software, the job file will restore all archived settings. For exporting jobs in XML format, you can use the script *asjobexport.pl*.

Jobs and imported parameter templates can be removed from the database with *asdeletejobs.pl*. The script can remove all unused parameter records (settings, calibration, geometry). Only parameter records that were loaded with the XML importer are deleted. Settings that were created in the ARRISCAN GUI (Marvin) are not removed even if they are not used by any job.

There are a few more things to consider for facilities that run several ARRISCANs in parallel - a concept eagerly supported by ARRI. There is one job database and, for each scanner, a separate machine database. The latter is used to store parameter sets that may be machine-specific, i.e., filmcalibration, lut, and colormap. For those parameters you can specify the scanner for which they are targeted in the form `scanner="0000"`. "0000" stands for the serial number of the scanner. Without the scanner specification, the parameter set is uploaded into the databases of *all* scanners. The single job database builds a shared job queue for all scanners.

5.4.2 Job File Elements

5.4.2.1 arriscan

This is the root element of the job file.

Attributes	Type	Description
namingconflict	enum	Handling of duplicate names: 'ignore', 'replace', 'error'
version	float	Version of the ARRISCAN XML job file

Childs	Number	Description
<i>batch</i> (page 198)	{0,n}	Batch list of jobs
<i>filmcalibration</i> (page 211)	{0,n}	Film calibration parameter
<i>outputgeometry</i> (page 205)	{0,n}	Geometry parameter for image size
<i>scantemplate</i> (page 206)	{0,n}	Scan parameter used for service mode
<i>outputtemplate</i> (page 207)	{0,n}	Parameter for file format and image processing
<i>jobpath</i> (page 204)	{0,n}	Root path for jobs
<i>outputlut</i> (page 214)	{0,n}	One-dimensional, three-channel lookup table used in the outputtemplate
<i>lut</i> (page 215)	{0,n}	One-dimensional, three-channel lookup table used in the filmcalibration
<i>colormap</i> (page 215)	{0,n}	3x3 color matrix or 3D LUT.

Notes

1.) The meaning of the options for namingconflict are

- ignore: do not import parameter from job file if the database contains a record with the same name. This is the default.
- replace: replace existing records with the same name.
- error: report naming conflict as error, do not import any of the parameters or jobs.

2.) The version attribute is optional. The current version is 1.0.

5.4.2.2 batch

A list of jobs that share the same parameters. The batch element is supposed to ease the creation of the job file. Instead of specifying the parameters for each single job, all jobs with the same parameter set are grouped into one batch. You can have several batch elements in one job file.

Attributes	Type	Description
name	char	Name of the batch. For reference only.
project	char	Name of the project
reel	char	Name of the reel
perfperframe	enum	Film format and gauge. Valid values are '1', '2', '3', '4', and '8'. Default is 4.
scantemplate	ref	Name of the scan template. If no name is given, the default scan mode is used.
outputgeometry	ref	Name of the geometry parameter that defines the image size
outputtemplate	ref	Name of the output template
focusgeometry	ref	Unused
tcbase	float	Frame rate for timecode in DPX header (24, 25, or 30)
tcstart	char	Timecode of reference frame (for DPX header): 'hh:mm:ss:ff'
jobpath	char	Root path for the jobs
hirespath	char	Path for the hires images
hiresoriginalpath	char	Path for uncorrected hires images
irpath	char	Path for defect map

proxypath	char	Path for the 1k images
logpath	char	Path of the job logfile

Childs	Number	Description
<i>matchingrules</i> (page 202)	{0,1}	Definition of rules for matching jobs in the file against jobs in the database.
<i>script</i> (page 204)	{0,1}	Scripting parameters
<i>job</i> (page 200)	{1,n}	List of jobs

Notes

The name of the batch is used only to trace error messages of the import module.

The path for the hires and proxy images is appended to the root path. The strings can contain a placeholder for the job name '\${jobname}'. The frame number is expressed with a printf-style pattern like '%d' or '%05d'. %RESOLUTION% is a placeholder that is replaced in the Marvin application by the actual image size formatted as [width]x[height].

No scantemplate needs to be specified. It is used for service mode only.

The meaning of the perfperframe values are

perfperframe	Film Format and Gauge
1	16 mm
2	35 mm 2perf
3	35 mm 3perf
4	35 mm 4perf
8	35 mm 8perf

Note: 8perf scanning is not supported yet.

Examples

Below is an example for defining a batch of jobs that share a number of parameters:

```
<jobpath name="server1"
  path="ftp://guest:guest@server1/array0/scans/" />
<batch name="batch1"
  jobpath="server1"
  hirespath="${jobname}/%RESOLUTION%/${jobname}.%05d.cin"
  proxypath="${jobname}/%RESOLUTION%/${jobname}.%05d.cin"
  logpath="/server1/scannerlog/${jobname}.log"
  ...
</batch>
```

While images can be transferred by ftp, the logfile has to be in a mounted filesystem.

5.4.2.3 job

A job is a sequence of contiguous images that are stored within the same directory.

Attributes	Type	Description
name	char	Name of the job
startframe	int	Position of the first frame
keycode	char	Key code of the first frame
jogperf	int	Number of perfs to jog to realign frame, default is zero
frames	int	Number of frames to scan
incframes	int	Frame increment, defaults to one
holdframes	int	Number of times a frame is repeated, defaults to one
filmcalibration	ref	Name of the film calibration parameter
focuscueframe	int	Frame offset where autofocus is performed, defaults to zero
nrfirstframe	int	Frame number of first file, defaults to one
tcstart	char	Timecode of first frame (for DPX header): 'hh:mm:ss:ff'
hirespath	char	Path for the hires images
hiresoriginalpath	char	Path for uncorrected hires images
irpath	char	Path for defect map

proxypath	char	Path for the 1k images
logpath	char	Path of the job logfile
autofocus	enum	Autofocus mode: 'no', or 'always'
autoperforesearch	enum	No lomger used, ignored.
userdata	char	A string that is stored in the database and printed in the logfile

Childs	Number	Description
<i>script</i> (page 204)	{0,1}	Scripting parameters

Notes

The names of jobs do not have to be unique. You may scan two or more ranges of the same take in the same directory. You have to set startnumber accordingly.

The log file starts with the contents of userdata. Each image file is listed with its full path name.

You can set the timecode for each single job. Otherwise, startframe is added to the timecode of the batch, which defaults to 00:00:00:00. Hence you have three options to specify the timecode

- Don't set batch time code, specify an absolute startframe as timecode or frame number.
- Set reel start time code in batch and give relative start number for each job.
- Specify timecode and startframe for each job. This may be necessary if you have a reel with selected shots and non-continuous source time code.

The key code is specified as a string like this: EZ 123456 1234+00. The first two letters are the film id, the six digits are the prefix, followed by the count, which is incremented every 20 perfs with 16 mm and every 64 perfs with 35 mm film. The last two digits are the offset in perforations from the last counter increment. This format of key code is closely related to the way it is encoded in the DPX file header. Any character can be used as separator, so EZ-123456-1234-00 would be a valid key code as well.

The key code may be used to locate the clip on a reel or in combination with a startframe. This combination is useful for tracking since the actual start key code of each job is logged in the database and can be compared with the imported key code.

The meanings of the options for autofocus are

- no: no auto focus
- always: perform auto focus

A future version of the ARRISCAN software will support an 'onchange' mode, where the auto focus is only performed if the key code prefix has changed. The specification of focuscueframe is useful only if autofocus is on.

The parameter autopereforesearch is outdated, this mode is always on.

You can set hirespath, hiresoriginalpath, proxypath, irpath, or logpath in the batch element or individually for each job. The same rule applies to the script element.

Examples

The following three batches define the same jobs:

```
<batch tcbase="25.0" tcstart="01:00:00:00">
  <job name="177-5B_01" startframe="1000" frames="110"/>
  <job name="177-5B_03" startframe="1200" frames="70"/>
  <job name="177-5B_04" startframe="1300" frames="65"/>
  <job name="178-3_01" startframe="2345" frames="62"/>
</batch>

<batch tcbase="25.0" tcstart="01:00:00:00">
  <job name="177-5B_01" tcstart="00:00:40:00" frames="110"/>
  <job name="177-5B_03" tcstart="00:00:48:00" frames="70"/>
  <job name="177-5B_04" tcstart="00:00:52:00" frames="65"/>
  <job name="178-3_01" tcstart="00:01:33:20" frames="62"/>
</batch>

<batch tcbase="25.0">
  <job name="177-5B_01" startframe="91000" frames="110"/>
  <job name="177-5B_03" startframe="91200" frames="70"/>
  <job name="177-5B_04" startframe="91300" frames="65"/>
  <job name="178-3_01" startframe="92345" frames="62"/>
</batch>
```

</batch>

5.4.2.4 matchingrules

Definition of rules matching jobs in the file against jobs in the database.

Attributes	Type	Description
action	enum	What to do with jobs matching existing jobs: 'replace' or 'ignore'

Childs	Number	Description
<i>match</i> (page 203)	{1,n}	Criterion by which jobs are compared.

5.4.2.5 match

Criterion defining how jobs are compared.

Attributes	Type	Description
attribute	enum	Attribute used for comparison, one of 'name', 'startframe', 'frames', 'reel', or 'project'

Childs	Number	Description
None		

Examples

This rule says that jobs that have the same name, project, reel, and startframe as existing jobs are not imported into the database

```
<matchingrules action="ignore">
  <match attribute="name"/>
  <match attribute="project"/>
  <match attribute="reel"/>
  <match attribute="startframe"/>
</matchingrules>
```

This rule replaces all jobs in the database that have the same name in the same project (regardless of the other attributes).

```
<matchingrules action="replace">
  <match attribute="name"/>
  <match attribute="project"/>
```

```
</matchingrules>
```

5.4.2.6 script

Scripting parameters.

Attributes	Type	Description
onstart	char	Name of the script that is executed before the job.
onend	char	Name of the script that is executed after the job.
onframe	char	Name of the script that is executed after each frame.
onerror	char	Name of the script that is executed in case of an error.
environment	char	Additional environment variables for the scripts.

Childs	Number	Description
--------	--------	-------------

None

Notes

The environment variables are written as a semicolon separated list, for example:

```
myserver=192.168.133.10; myroot=/srv/scans
```

5.4.2.7 jobpath

Root path for jobs.

Attributes	Type	Description
name	id	Name of the path or mount point
path	char	Path or mount point
directIo	bool	Use DirectIO (bypass OS file buffering)?
parallelWrites	int	Number of parallel write threads

Childs	Number	Description
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None

5.4.2.8 outputgeometry

Scan size and position in micrometers. The origin of the coordinates is the registration pin.

Attributes	Type	Description
name	id	Name of the setting
proxyformat	ref	Name of the proxy settings
scanmode	enum	Scan mode: '3k', '3k2k', '6k', '6k4k', or '6k2k'
pitch	float	Pixel pitch in μm
xsize	int	Image width in pixels
ysize	int	Image height in pixels
xorigin	float	Horizontal offset from registration pin in microm
yorigin	float	Vertical offset from registration pin in microm
xoffset	int	Horizontal offset in pixels
yoffset	int	Vertical offset in pixels
gate	enum	Gate type: '35 mm', '16 mm'.
adaptor	bool	Use 16 mm adaptor?

sensortiming ref Primary key of the sensor timing definition: '1' for 35 mm or '2' for 16 mm

Childs	Number	Description
--------	--------	-------------

None

Notes

Currently, the ARRISCAN supports 6 different pitches

Pitch	Decsription
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1	1828 across academy or 2048 across full aperture (35mm)
2	1920 across academy (35mm)
3	2048 across academy (35mm)
4	1828 across full aperture (35mm)
5	1920 across full aperture (35mm)
6	2048 across full aperture (16mm)

In the table above the resolution is given as "2k", but for "3k", "4k", and "6k" the same pitch values are used. E.g., a "4k" scan with 4096 pixels across academy uses pitch 3.

5.4.2.9 scantemplate

Parameters in this template are only for use by ARRI service.

Attributes	Type	Description
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name	id	Name of the template.
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Childs	Number	Description
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None

5.4.2.10 proxyformat

Size and aspect ratio of proxy images.

Attributes	Type	Description
name	id	Name of the proxy settings.
proxyaspect	float	Pixel aspect ratio of the proxy image.
proxyscaledwidth	int	Width of the intermediate scaled image (in pixels).
proxyscaledheight	int	Height of the intermediate scaled image (in pixels).
proxycrispsoft	float	Sharpness parameter for the proxy downscaling filter.
proxycroppad	bool	Use a different size for the output image (for letter- or pillarboxing). Parameters below are only relevant if proxycroppad is 'true'.
proxycentered	bool	Automatically center the intermediate scaled image inside the output image. Otherwise, the parameters 'proxyoffsetx' and 'proxyoffsety' are used to position the image.
proxyoffsetx	int	Horizontal offset of the intermediate scaled image inside the output image (in pixels; used only if 'proxycentered' is 'false').
proxyoffsety	int	Vertical offset of the intermediate scaled image inside the output image (in pixels; used only if 'proxycentered' is 'false').
proxyoutputwidth	int	Width of output image (in pixels).
proxyoutputheight	int	Height of output image (in pixels).

Childs	Number	Description
None		

5.4.2.11 outputtemplate

Parameters for file format and image processing. The outputtemplate corresponds to the data format setting in the ARRISCAN GUI.

Attributes	Type	Description
name	id	Name of the data format setting.
hiresfileformat	char	Hires file format: 'cineon', 'dpx10', 'dpx16', 'tiff16', or 'none'
hiresmetric	enum	Metric of hires image: 'normalized', 'logneg', 'logip', or 'lut'
proxy1kfileformat	char	1k proxy file format: 'cineon', 'dpx10', 'dpx16', 'tiff16', 'tiff8', 'none',
proxy1kmetric	enum	Metric of proxy image: 'normalized', 'log-neg', 'log-ip', or 'lut'
dpxtransferspec	int	Value for the field 21.7 in the DPX header, defaults to 3 ('logarithmic')
outputlut	ref	Name of output LUT.
irdefmapsettings	ref	Name of the DICE settings.
hiresoriginalactive	bool	Save unprocessed scan as well.
kcdpxformat	enum	Format for saving key code in the DPX file header: 'smpte' (perf offset), 'feetframes' (frame offset), or 'framesasperfs' (non-frame-accurate perf offset).
Childs	Number	Description
<i>dice</i> (page 210)	{0,1}	Parameter for DICE software. Deprecated, use irdefmapsettings.
<i>lin2log</i> (page 209)	{0,1}	Parameter for lin to log conversion.

Notes

The possible settings for hiresmetric and proxy1kmetric are

- normalized: linear transmission, base density is scaled to a 16 bit value of 42000.
- log-neg: linear density
- log-ip: linear inverted density
- lut: use custom output LUT

With custom LUTs you may have to set the value of dpxtransferspec if your DPX reader honors this field. Refer to table 5a of the SMPTE DPX standard. The default value of dpxtransferspec is 3 for a hiresmetric value 'log-neg' or 'log-ip' and 0 for all other metric values.

For the metric values 'log-neg' and 'log-ip' the conversion parameters need to be set with the lin2log element.

5.4.2.12 lin2log

Parameter for default lin to log conversion.

Attributes	Type	Description
cinbase	int	Base code value (default: 95)
cinbaseir	int	Base code value in IR channel (default: 95)
cinfactorred	float	Red gain (default: 541)
cinfactorgreen	float	Green gain (default: 500)
cinfactorblue	float	Blue gain (default: 500)
cinfactorir	float	IR gain (default: 500)
ipblackshiftred	int	Shift black point of IP in red (default: 0)
ipblackshiftgreen	int	Shift black point of IP in green (default: 0)
ipblackshiftblue	int	Shift black point of IP in blue (default: 0)

Childs	Number	Description
None		

Notes

The formula for the default log conversion is: $\text{cineon_code_value} = \text{cinbase} + \text{cinfactor} * \text{density}$. You have to specify the factor for each channel separately. The default values are 95 for cinbase and 500 for cinfactor. This results in a density range of 1.86 above base.

The formula for the default log IP conversion is: $\text{cineon_code_value} = \text{cinbase} + \text{cinfactor} * (\text{ipblack} - \text{density})$. ipblack is chosen such that scanning an IP from a camera negative results in the same code values as if the camera negative was scanned, assuming that the standard camera negative LAD (0.80, 1.20, 1.60) is printed to standard IP LAD (1.15, 1.60, 1.70). Depending on the actual LAD values, it may be necessary to change ipblack. This is done with the ipblackshiftred, ipblackshiftgreen, and ipblackshiftblue values. They are scaled in pinter lights and each increment shifts ipblack by 0.025.

The parameters cinbaseir and cinfactorir are only used when the IR defect map is saved.

5.4.2.13 dice

DICE parameters. Deprecated: use irdefmapsettings.

Attributes	Type	Description
irfileformat	enum	Format of the IR defect matte: 'alpha', 'cineon', 'dpx10', 'lustre', 'tiff8', 'tiff8_comp', or 'none'
irdefcor	enum	Defect correction mode: 'reconstruct_raw', 'reconstruct_aggressive', 'reconstruct_conservative', 'conceal_raw', 'conceal_aggressive', or 'conceal_conservative'
hiresoriginalactive	bool	Save unprocessed scan as well
irdefmapthres	int	Threshold for converting multilevel defect maps to bilevel maps (-1, 0-100)

Childs	Number	Description
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None		
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5.4.2.14 irdefmapsettings

Defect correction parameters.

Attributes	Type	Description
name	id	Name of the defect map settings
irfileformat	enum	Storage format for the defect map: 'alpha', 'lustre', 'dualelement', 'tiff8', 'tiff8_comp', or 'none'
irdefcor	enum	Defect correction mode: 'detect', 'reconstruct_aggressive', 'reconstruct_conservative', 'conceal_aggressive', 'conceal_conservative'
irdefdetect	enum	Defect detection sensitivity: 'low' or 'high'
irdefmap	enum	Defect map encoding: 'trilevel', 'bilevel', 'bilevel_cmpl'

Childs	Number	Description
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None		
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Notes

The possible settings for irfileformat are:

- alpha: Store defect data in alpha channel of the high resolution image.
- lustre: Store defect data as bilevel map in unused 2 bits of the image data in the high resolution DPX file. Supported by Discreet Lustre from version 3.0.
- dualelement: Store defect data as second image element inside the high resolution DPX file. Supported by The Pixel Farm's PFClean.
- tiff8: Store defect data as 8-bit TIFF file.
- tiff8_comp: Store defect data as 8-bit TIFF file with ZIP compression.

The settings for the irdefcor parameter are mapped to corresponding defect correction settings in the GUI as follows:

- detect: Detect only.
- reconstruct_aggressive: Low strength, correct all defects.
- reconstruct_conservative: Low strength, don't correct critical defects.
- conceal_aggressive: High strength, correct all defects.
- conceal_conservative: High strength, don't correct critical defects.

The possible settings for irdefmap are:

- trilevel: Trilevel map.
- bilevel: Bilevel map containing only critical (uncorrected) defects.
- bilevel_cmpl: Bilevel map containing both correctable and critical defects.

5.4.2.15 filmcalibration

Exposure values for different film stocks.

Attributes	Type	Description
name	char	Name of the film calibration
manuid	int	Key code manufacturer ID
filmtype	int	Key code film type
project	char	Name of project
projectall	bool	Use for all projects
enpercr1	float	Red LED energy
enpercr2	float	Red LED energy
enpercg	float	Green LED energy
enpercb	float	Blue LED energy
enpercir	float	IR LED energy
ampsr1	float	Red LED current
ampsr2	float	Red LED current
ampsg	float	Green LED current
ampsb	float	Blue LED current
ampsir	float	IR LED current
baseliner	float	Red base value
baselineg	float	Green base value
baselineb	float	Blue base value
baselineir	float	IR base value
crosstalkir	float	Percent of crosstalk from red channel to ir channel measured in density space
focusposoffset	int	Position of the camera in units of stepper steps

mtftype	enum	Influences the downsample filters, possible values: 'ocn' or 'intermed'. Deprecated. Use 'filter' instead
filter	enum	Filter type: 'hicon-2' or 'ocn-2'. Older filters 'hicon-1' and 'ocn-2' are still supported for compatibility
crispsoft	int	Parameter for the dynamic calculation of downsample filters. Range depends on filter type and offset values (see attributes below)
filterOffsetRed	int	Offset which is added to the crispsoft value when the red channel is downsampled
filterOffsetBlue	int	Offset which is added to the crispsoft value when the blue channel is downsampled
scanner	list	List of scanners
colormap	ref	Name of colormap

Childs	Number	Description
lcl	{0,1}	Deprecated

Notes

The manuid, filmttype, project, and projectall are used for the automatic selection of the film calibration.

The LED energy values are expressed as percentage values. A value of 100% corresponds to the maximum level as determined by the machine calibration. This value is found in the first line of the lightsresult table.

The baseline values are the average camera code values of the film base scaled to 1.0.

Higher values for crispsoft are only useful for fine grain films.

The lcl can be used to set film type specific LUTs.

Multiple scanners only: You can specify a list of scanners for which the filmcalibration is used. Without a specified scanner, the parameter set is uploaded into all machine databases.

5.4.2.16 lcl

LUT/colormap/LUT

This element is deprecated.

Attributes	Type	Description
lut1	ref	Name of the pre-colormap LUT
lut2	ref	Name of the post-colormap LUT
colormap	ref	Name of the colormap

Childs	Number	Description
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None

Now, the filmcalibration directly references the colormap, which in turn references the pre and post LUT.

5.4.2.17 outputlut

One dimensional, three channel lookup table used in the data formats for linear image data with custom output conversion. The LUT values are given as 16 bit integer values.

Attributes	Type	Description
name	id	Name of the LUT

Childs	Number	Description
data	{0,1}	65536 x 4 values separated by white space, channel interleaved (RGB) starting with Index
<i>datafile</i> (page 217)	{0,1}	Path to external data file

Notes

Use either the datafile or the data element.

The format of the external data file is the same as for the inlined data.

Multiple scanners only: You can specify a list of scanners for which the LUT is used. Without a scanner, the LUT is uploaded into all machine databases.

Examples

The data of an output LUT is formatted as shown below:

```
<data>
  0  0  0  0
  1  1  1  1
  2  1  2  1
  3  2  3  2
  ...
</data>
```

5.4.2.18 lut

One dimensional, three channel lookup table as part of the lcl parameter set. The format is the same as in outputlut.

Attributes	Type	Description
name	id	Name of the LUT
type	enum	LUT type: 'float' or 'int'
scanner	list	List of scanners

Childs	Number	Description
data	{0,1}	65536 x 4 values seperated by white space, channel interleaved (RGB) starting with Index
<i>datafile</i> (page 217)	{0,1}	Path to external data file

Notes

LUTs with type='float' are used as pre colormap LUT.

LUTs with type='int' are used as post colormap LUT.

5.4.2.19 colormap

3x3 color matrix or 3D LUT.

Attributes	Type	Description
name	id	Name of the colormap
type	enum	The only type is 'matrix' (can be omitted)
version	char	Version number
manuid	int	Key code manufacturer ID
filmtype	int	Key code film type
lut1	ref	Name of the pre-colormap LUT
lut2	ref	Name of the post-colormap LUT
scanner	list	List of scanners

Childs	Number	Description
data	{0,1}	The coefficients of the matrix. 9 float values separated by white space in row major order
<i>datafile</i> (page 217)	{0,1}	Path to external data file

Notes

Use either the datafile or the data element.

The format of the external data file is the same as for the inlined data.

Colormaps of type 3dlut are not supported yet.

If the values for lut1 and lut2 are not set, the default pre and post LUTs are used.

Colormaps can be marked as being specific for one film stock by using the filmtype and manuid from the key code. This influences only the selection of colormaps in the film calibration dialog of the ARRISCAN software. Colormaps without filmtype and manuid are regarded as universal and can be selected for any film stock.

Multiple scanners only: You can specify a list of scanners for which the colormap is used. Without scanner the colormap is uploaded into all machine databases.

Examples

Below is an example of a simple colormap:

```
<colormap name="unity">
<data>
    1.0 0.0 0.0
    0.0 1.0 0.0
    0.0 0.0 1.0
</data>
</colormap>
```

5.4.2.20 datafile

Path to external data file.

Attributes	Type	Description
path	char	Path to a local file (no FTP).

Childs	Number	Description
--------	--------	-------------

None

5.4.3 Scripts

This chapter contains the manuals of the import and export scripts and other utilities.

5.4.3.1 **asjobimport.pl**

Import jobs and parameters into the ARRISCAN database.

SYNOPSIS

asjobimport.pl [-options] jobfile

Options: --help --man --tidy --nc --dbg --dbhost --dbname --dbuser --dbpass

OPTIONS

--help

Print a brief help message and exits.

--man

Print the manual page and exits.

--tidy

Run tidy on the XML file first. tidy is a freeware utility for checking the correctness of XML files. See <http://www.w3.org/People/Raggett> (<http://www.w3.org/People/Raggett>) for details.

--nc

Set handling of naming conflicts. Possible values are: 'ignore', 'replace', or 'error'. A naming conflict occurs when you try to import a template with a name already in the database. The option defines what the importer will do: ignore the template in the job file but import other templates and jobs, replace the template in the database, or print an error message and exit without importing.

-dbg

Set options for diagnostic output.

-dbhost

Specify the name (or IP address) of the host where the job database is located. By default, the database configuration is taken from environment variables.

-dbname

Specify the name of the job database (default is asjob). This option can only be used in combination with -dbhost.

-dbuser

Specify the user for the job database. This option can only be used in combination with -dbhost.

-dbpass

Specify the password for the job database. This option can only be used in combination with -dbhost.

DESCRIPTION

asjobimport.pl imports ARRISCAN job files into the database. The format of the job file is described in a separate HTML document.

5.4.3.2 asjobexport.pl

Export jobs and parameters from ARRISCAN database into a XML file.

SYNOPSIS

asjobexport.pl [-options] jobfile

Options: --help --man --project --reel --anonym --nolut --inline

OPTIONS

--help

Print a brief help message and exits.

--man

Print the manual page and exits.

--project

Name of the project from which the jobs are exported. This option is mandatory.

--reel

Additionally you may specify a specific reel.

--anonym

Print machine parameters like filmcalibration without scanner name.

--inline c|l|o

Inline colormaps, luts, and outputluts in the XML file. The default is --inline c, that is colormaps are inline while luts are written to an external file. The datafile will have the name of the lut prefixed by the project name.

--nolut

Do not export default pre and post-colormap LUT.

DESCRIPTION

asjobexport.pl exports jobs and related parameter records (templates, calibration, geometry) into an XML file. The file can be imported again into the database with asjobimport.pl. Incomplete jobs imported with one of the import filters are not exported because an XML job file can contain complete jobs only.

5.4.3.3 asdeletejobs.pl

Delete jobs and parameters from ARRISCAN database.

SYNOPSIS

asdeletejobs.pl [-options]

Options: --help --man --project --reel --clean --donotask --dbhost --dbname --dbuser --dbpass

OPTIONS

--help

Print a brief help message and exits.

--man

Print the manual page and exits.

--project

Name of the project from which the jobs are deleted.

--reel

Name of the reel from which the jobs are deleted.

--clean

Delete unused parameter records.

--donotask

Don't ask for confirmation. This option is useful when you start asdeletejobs.pl within another script.

-dbhost

Specify the name (or IP address) of the host where the job database is located. By default, the database configuration is taken from environment variables.

-dbname

Specify the name of the job database (default is asjob). This option can only be used in combination with -dbhost.

-dbuser

Specify the user for the job database. This option can only be used in combination with -dbhost.

-dbpass

Specify the password for the job database. This option can only be used in combination with -dbhost.

DESCRIPTION

asdeletejobs may be used to delete all jobs from a project or jobs from a single reel of a project. With the --clean option all unused parameter records (templates, calibration, geometry) are removed as well. Only parameter records that were loaded with the XML importer (see asjobimport) are deleted. Parameters that were created in Marvin are not removed even if they are not used by any job. If asdeletejobs is started without the --project but with the --clean option, it deletes unused parameter records only.

Version 1.1 of the script removes the project from the database after all jobs are deleted.

5.4.3.4 **astabbedimport.pl**

Imports scan lists in tabulated (tabbed) format.

SYNOPSIS

`astabbedimport.pl [-options] file1 [file2 ...]`

Options: `--help` `--man` `--naming|n <id>` `--project <name>` | `--pid <id>` `--handles <n>` `--gauge 1|2|3|4` `--tcbase 24|25|30` `--priority timecode|keycode` `--nodupes` `--merge none|list|db` `--verbose` `--test`

OPTIONS

`--help`

Print a brief help message and exit.

`--man`

Print the manual page and exit.

`--naming`

Database id (primary key) of naming template. Mandatory.

`--pid`

Database id (primary key) of project.

`--project`

Name of project. You have to specify a project with `--project` or `--pid`.

`--handles`

Number of handles added at head and tail of each clip.

`--tcbase`

Time code base, number of frames per second. Default is 25 fps.

`--gauge`

Film gauge: 1 (16 mm), 2 (35mm 2perf), 3 (35mm 4perf), 4 (35mm 4perf). Default is 4.

--priority

Rules whether clips are sorted and compared by timecode or keycode. The default behavior is to use keycode if the tabulated list contains a KEYCODE column, no matter whether an additional TIMECODE column is present or not. You will find more information [here](#).

--nodupes

Don't import clips already included in existing jobs.

--merge

Valid values are "none", which is the default, "list", or "db". With "--merge list", overlapping clips in the scan list(s) are merged into one job. If the importer is even to merge new clips into existing jobs, that have not yet been executed, use "--merge db".

--verbose

Show verbose output during clip import.

--test

Loads scan list(s) and process names but does not import any jobs into the database. Mostly useful in combination with --verbose option to preview the results of the name processing.

DESCRIPTION

This import filter reads scan lists in tabulated format. Lines starting with a hash (" # ") symbol are ignored and can be used for comments. The first non comment line has to be a list of column headers separated by tab stops. Multiple tab stops are regarded as a single delimiter. The further lines contain the values formatted in the same manner. Each column header defines a variable that can be used in the name processing.

A minimal scan list for the ARRISCAN that could be processed with one of the naming templates given above as example #1 or #2 could look like this

# Minimal scan list for ARRISCAN		
SCANREEL	STARTFRAME	FRAMES
nr1	1500	100
nr1	15000	250
nr2	7500	100
nr1	15500	300

If the take names are to be used as in example #3, a fourth column is needed in the list.

SCANREEL	STARTFRAME	FRAMES	TAKE
nr1	1500	100	112/1
nr1	15000	250	115/7 A
nr2	7500	100	64/7 B
nr1	15500	300	115/7 A

Neither the order of the columns nor the order of scan reels and start frames matters.

A tabulated list with keycodes could look like this:

# Minimal scanlist with keycodes (4perf)				
SCANREEL	KEYCODE		FRAMES	TAKE
mnr01	KK 111111 1000+10		100	1/1
mnr01	KK 111111 1010+00		100	1/2
mnr01	KK 123456 1000+10		100	1/1
mnr01	KK 123456 1010+00		100	1/2

The key code is expressed as film id, prefix, feet, and frames (not in count and perfs as you have to use in the XML job file format). You may add an additional perf indicator by adding a dot or the letter "p", for example:

KK 123456 1000+10.3
KK 123456 1000+10 p3

The key code strings may also be formatted as they appear in a FilmScribe pull list:

KK 12 3456-1000+00

The usage of the ampersand symbol "&" in 16 mm key code is supported as well:

EB 70 6465-6097&13

5.4.3.5 asedlimport.pl

Imports EDL files for scanning.

SYNOPSIS

asedlimport [-options] file1 [file2 ...]

Options: --help --man --naming|n <id> --project <name> | --pid <id> --handles <n> --tcbase 24|25|30 -- nodupes --merge none|list|db --zerotc --verbose --test

OPTIONS

--help

Print a brief help message and exit.

--man

Print the manual page and exit.

--naming

Database id (primary key) of naming template. Mandatory.

--pid

Database id (primary key) of project.

--project

Name of project. You have to specify a project with --project or --pid.

--handles

Number of handles added at head and tail of each clip.

--tcbase

For time code or frame number based scan lists: number of frames per second.
Default is 25 fps.

--nodupes

Don't import clips that are already included in existing jobs.

--merge

Valid values are "none", which is the default, "list", or "db". With "--merge list", overlapping clips in the scan list(s) are merged into one job. If the importer is even to merge new clips into existing jobs that have not yet been executed, use "--merge db".

--zerotc

By default, the source timecode including the hours is converted into frame count. For example, a source timecode of 01:01:00:00 will become a start frame count of 91500. This assumes that you set the reference frame count at the start of the reel to 01:00:00:00 (90000). With the --zerotc options, the hour in the source time code will not be included and the start frame count in the example will be 1500. With this option you have to set the reference frame count of each reel to zero. Nevertheless, the timecode in the DPX header will be original source timecode. You can't set this option through the configuration dialog in Marvin. You have to add it manually.

--verbose

Show verbose output during clip import.

--test

Loads scan list(s) and process names but does not import any jobs into the database. Mostly useful in combination with --verbose option to preview the results of the name processing.

DESCRIPTION

This import filter reads EDLs in CMX3600 format. It accounts for motion events and dissolves. For the name processing, you can use the following variables:

PROJECT	project name
PROGRAM	name of EDL with extension stripped off
TITLE	title line from EDL
EVENT	EDL event number
SCANREEL	tape or reel name from EDL
STARTFRAME	first frame of job on scan reel
FRAMES	number of frames
TIMECODE	source time code

When the EDL includes comments like "* FROM CLIP NAME:", everything following the colon is stored in the variable TAKE.

5.4.3.6 **aspullimport.pl**

Imports pull and cut lists.

SYNOPSIS

aspullimport.pl [-options] file1 [file2 ...]

Options: --help --man --naming|n <id> --project <name> | --pid <id> --handles <n> --gauge 1|2|3|5 --tcbase 24|25|30 --priority timecode|keycode --nodupes --merge none|list|db --format --verbose --test

OPTIONS

--help

Print a brief help message and exit.

--man

Print the manual page and exit.

--naming

Database id (primary key) of naming template. Mandatory.

--pid

Database id (primary key) of project.

--project

Name of project. You have to specify a project with --project or --pid.

--handles

Number of handles that are added at head and tail of each clip.

--tcbase

Time code base, number of frames per second. Default is 25 fps.

--gauge

Film gauge: 1 (16 mm), 2 (35mm 2perf), 3 (35mm 4perf), 4 (35mm 4perf). Default is 4.

--priority

Rules whether clips are sorted and compared by timecode or keycode. The default behavior is to use keycode if the tabulated list contains a KEYCODE column, no matter whether an additional TIMECODE column is present or not. You will find more information [here](#).

--nodupes

Don't import clips that are already included in existing jobs.

--merge

Valid values are "none", which is the default, "list", or "db". With "--merge list", overlapping clips in the scan list(s) are merged into one job. If the importer is even to merge new clips into existing jobs that have not yet been executed, use "--merge db".

--verbose

Show verbose output during clip import.

--test

Loads scan list(s) and process names but does not import any jobs into the database. Mostly useful in combination with --verbose option to preview the results of the name processing.

DESCRIPTION

This import filter reads lists as they are generated by the Avid® FilmScribe™ utility: pull lists and cut lists. It does not read optical lists, though.

Pull lists have to be in tabulated format, the format is similar to the one used in `astabbedimport.pl`. An example:

Event	KNStart	KNEnd	TCStart	TCEnd	Labroll
Clip	Scene/Take				
1	EV 75 1812-6083+13	6084+06	01:00:00:13	01:00:00:22	LAB001
01/1	01/1				
4	EV 75 1812-6098+10	6102+07	01:00:10:00	01:00:12:11	LAB001
01/3	01/3				

The difference is that in the latter the user defines the column names by itself while in the former the column names are generated by FilmScribe (or any other application used to generate the pull list).

Cut lists have to be in columnar format:

3.22			13 events	handles = -1			
Picture 1			0 dupes	total footage:	380+10		
Assemble List			0 opticals	total time:	00:04:13:18		

Name	Footage	Duration	First/Last Key	Address TC	Lab Roll	Clip	
1.	0+00	19+05	k? 55 7749-7233+04	00:22:55:08	0000002	7-4-1	
	19+04		7252+08	00:23:07:16			
2.	19+05	5+11	k? 08 4597-3989+00	00:27:09:23	0000002	72A-5a	
	24+15		3994+10	00:27:13:13			

The mapping of the columns in the pull or cut list to the variables for the naming processing is defined in a XML file.

importcfg.xml

The default configuration is in the file /usr/arri/bin/importfilter/importcfg.xml

```
<importer>
<!-- Tabulated Pull Lists -->
<format name="PullList" start="KNStart\tKNEnd"
separator="\t" inclusive="1">
  <row skip="^#" />

  <column name="KNStart" variable="KEYCODE" />
  <column name="KNEnd" variable="LASTKEY" />
  <column name="Labroll" variable="SCANREEL" />
  <column name="Clip" variable="TAKE" />
  <column name="TCStart" variable="TIMECODE" />
  <column name="TCEnd" variable="OUT" />
</format>

<!-- Cut (Assemble) Lists -->
<format name="CutList" start="First\Last Key"
end="(end of Assemble List)" inclusive="1">
  <row select="^ *\d+\." />
  <param mingap="2" maxcoldist="5" />

  <column name="First/Last Key" variable="KEYCODE">
    <subcol name="KNEnd" variable="LASTKEY" />
  </column>
  <column name="Lab Roll" variable="SCANREEL" />
  <column name="Clip Name" variable="TAKE" />
  <column name="Start TC" variable="TIMECODE" />
  <column name="Event" variable="EVENT" />
</format>
</importer>
```

It defines two formats, the first one is for tabulated pull lists. They are identified by a line containing "KNStart\tKNEnd". The columns are separated by tabs ("\t"). End key code and time code are inclusive. Rows starting with a hash are skipped.

In the second format, which is for cut lists and identified by a line containing "First/Last Key", the columns are not separated by any specific character. The spacing is used to identify the columns. At least two spaces have to be in between the column headers. In the cut list format, the columns may be either left, right, or center aligned with the column headers. The importer recognizes a new column if a gap of two spaces (mingap="2") occurs within a distance of 5 characters (maxcoldist="5") from the next column header. This mechanism allows the handling of column data containing spaces, for example key code or clip names. Only rows that start with an event number like "1." are used.

In both formats, a list of <column> tags defines the mapping of the column data to the importer variables. For example, in pull lists, the SCANREEL variable is set to the value of the column "Labroll", while in cut lists, the column "Lab Roll" (note the spelling) is used. If your lists have a "Tape" column that you want to use as SCANREEL, you change the entry to

```
<column name="Tape" variable="SCANREEL" />
```

In the columnar format, some data, like the last key code or last time code, is written in the next line. This is expressed by the subcol tag, which causes the importer to take the value from the same column position in the row below.

5.4.3.7 doframes.pl

Execute a command on a sequence of frames.

SYNOPSIS

doframes.pl [--help | --man] --src --start --end [options]

Options: --dst --inc --nst --cmd --check --error --wait --grace

OPTIONS

--help

Print a brief help message and exit.

--man

Print the manual page and exit.

--src

Pattern for source frames in printf format.

--start

First frame number.

--end

Last frame number.

--dst

Pattern for destination frames in printf format. Defaults to --dst.

--inc

Frame increment. Defaults to 1 for ascending and to -1 for descending sequences.

--nst

New start number for destination sequence. Defaults to --start.

--cmd

Command to execute for each frame. Defaults to "mv \$SRC \$DST".

`--check`

Handle existing destination frames, possible values: abort | replace | skip. The default is 'abort'.

`--error`

Handle non existing source frames, possible values: abort | ignore | retry | skip. The default is 'abort'.

`--wait`

Wait period for `--error` retry, the default value is 10 seconds.

`--grace`

Grace period after waiting, the default value is 10 seconds.

DESCRIPTION

`doframes.pl` is used to execute a command on a sequence of files. The files must be numbered in some regular form, e.g. 'file.0001.ext'. The default command renames (or renumbers) the sequence. If you want to do something different specify a command with the `--cmd` option. The command is a perl expression that is first evaluated and then passed to the shell for execution. The name of the current source and destination files is stored in the variables `$SRC` or `$DST`.

By default, `doframes.pl` aborts if the source frame does not exist and does not overwrite any destination frames. With the option `--error`, the handling of non existing source frames can be controlled.

```
--error abort: abort if source frame is missing
--error ignore: execute command (perhaps not very useful)
--error skip: skip this frame
--error wait: wait for the file to appear
```

For the wait mode there two more options. The wait period (`--wait`) is the interval `doframes.pl` will check for the file. The grace period (`--grace`) is an additional time waited after the file has appeared.

The handling of existing destination frames is controlled by `--check`:

```
--check abort: abort if source frame is existing
--check replace: replace existing files
--check skip: skip this frame
```

EXAMPLES

Rename the sequence file.[0001-0100].ext to newfile.[0001-0100].ext

```
doframes.pl --src file.%04d.ext --dst newfile.%04d.dst --start 1 --end 100
```

Renumber the sequence file.[0001-0100].ext to file.[0010-0109].ext. Note the descending order.

```
doframes.pl --src file.%04d.ext --start 100 --end 1 -nst 109
```

Delete any second frame in the sequence.

```
doframes.pl --src file.%04d.ext --start 1 --end 100 --inc 2 --cmd 'rm $DST' --  
check replace
```

Convert cineon to jpeg files using the fictitious command cin2jpg. Wait for missing files while checking every 3 seconds.

```
doframes.pl --src file.%04d.cin --start 1 --end 100 --dst file.%04d.jpg --cmd  
'cin2jpg $SRC $DST' --error retry --wait 3
```

Copy each frame from the source to the destination sequence if it does not exist already.

```
doframes.pl --src file.%04d.cin --start 1 --end 100 --dst tt2/file.%04d.cin --cmd  
'cp $SRC $DST' --check skip
```

Create a sequence of 100 empty files.

```
doframes.pl --src file.%04d.ext --start 1 --end 100 --cmd 'touch $DST' --error  
ignore
```

asdbio

Import and export of lookup tables and matrices. Type `asbio -h` on the command line for help.

5.4.3.8 ARRISCAN Perl Modules

The Perl modules are of interest for users who want to write their own import filters.

ARRISCAN.pm

Common perl module for ARRISCAN job import/export scripts. Read the manual page. View the module.

ARRISCAN/CONVERSION.pm

Perl module for timecode, feet, and frame conversion. Read the man page. View the module.

ARRISCAN/CLIP.pm

Perl module for clip objects. Read the manual page. View the module.

ARRISCAN/PRO.pm

Perl module for parsing program files (e.g. EDL's). Read the manual page. View the module.

5.5 Utilities

The following utilities may be useful for your work with the ARRISCAN.

Film Types

List of film types, stock numbers, and edge markings

Calculators

Time Code Calculator

Feet and Frame Calculator

Appendix

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A.1 The ARRISCAN DPX File Header

This section describes the metadata information that is written into the DPX file header by the ARRISCAN. We endorse the SMPTE Standard S268M-2003 and try to adhere to it as much as possible. However, the meaning of some header fields has changed due to modifications by different manufacturers. Some of these conventions have become a de-facto standard now.

A constant topic of discussion is the format of the key code information. It is defined to be in count-perf format by S268M-2003. As discussed in *An Introduction to Key Code* (page 160) and Key Code Offset in File Metadata, the de-facto standard is now to store key codes in feet-frame format, which is unfortunate because perf-accurate positioning becomes impossible. The ARRISCAN now supports both formats and uses the reserved area starting at field 57 of the DPX header to store additional information required for perf-accurate positioning. See the section about Motion Picture Film Information below for details.

There is no field in the DPX file header for the reel or tape name. Because this information is needed to unambiguously identify a source frame by time code, the ARRISCAN software writes the name into two fields:

- Field 38 (Input device name). This follows a convention proposed by Quantel.
- Field 74 (End of TV information header). This follows a convention proposed by Nucoda.

ARRISCAN DPX files have one image element only. The transfer characteristic (Field 21.7) for 10 bit log files is 3 (logarithmic). The value is set to 0 (user defined) for all other DPX files.

File Information

Field	Offset	Length	Type	Content
1	0	4	U32	Magic number (SDPX ASCII)
2	4	4	U32	Offset to image data in bytes (always 2048=0x0800)
3	8	8	ASCII	Version number of header format (V2.0)
4	16	4	U32	Total image file size in bytes
5	20	4	U32	Ditto key (always 1)
6	24	4	U32	Generic section header length in bytes
7	28	4	U32	Industry specific header length in bytes
8	32	4	U32	User-defined header length in bytes (always 0)
12	160	100	ASCII	Creator ('ARRISCAN###', where ### is the three digit serial number)

13	260	100	ASCII	Project name from Job Editor
----	-----	-----	-------	------------------------------

Image information

Field	Offset	Length	Type	Content
17	768	2	U16	Image orientation (always 0)
18	770	2	U16	Number of image elements (always 1)
19	772	4	U32	Pixels per line
20	776	4	U32	Lines per image element
21.1	780	4	U32	Data sign (always 0 = unsigned)
21.2	784	4	U32	Reference low data code value
21.4	792	4	U32	Reference high data code value (in 10 bit files: 1023=0x03FF)
21.7	801	1	U8	Transfer characteristic for image element 1 (logarithmic = 3 or user defined)
21.8	802	1	U8	Colorimetric specification for image element 1 (always 0)
21.9	803	1	U8	Bit size for image element 1 (in 10 bit files: 0x0A)
21.10	804	2	U16	Packing for image element 1 (in 10 bit files: filled = 1)
21.11	806	2	U16	Encoding for image element 1 (always none = 0)
21.12	808	4	U32	Offset to data for image element (always 2048=0x0800)

Image orientation information

Field	Offset	Length	Type	Content
30	1408	4	U32	X offset (always 0)
31	1412	4	U32	Y offset (always 0)
34	1424	4	U32	X original size (same as 19)
35	1428	4	U32	Y original size (same as 20)
38	1556	32	ASCII	Input device name (reel name from job editor, as proposed by Quantel)

Motion-picture film information

Field	Offset	Length	Type	Content
43	1664	2	ASCII	Film mfg. ID code (2 digits from film edge code)
44	1666	2	ASCII	Film type (2 digits from film edge code)
45	1668	2	ASCII	Offset in perfs (2 digits from film edge code) or (non-standard) frames (calculated from edge code and perfs per frame)
47	1670	6	ASCII	Prefix (6 digits from film edge code)
48	1676	4	ASCII	Count (4 digits from film edge code) or (non-standard) feet (calculated from edge code and perfs per frame)

Non-standard ARRI extensions

Field	Offset	Length	Type	Content
57.1	1864	4	ASCII	ID tag ('ARRI')
57.2	1868	2	ASCII	Version number (e.g. '01')
57.3	1870	4	ASCII	Count (4 digits; verbatim value from barcode)
57.4	1874	2	ASCII	Offset (2 digits; difference in perfs between foot reference dot and top perf of frame)
57.5	1876	4	ASCII	Feet (4 digits)
57.6	1880	2	ASCII	Frames (2 digits)
57.7	1882	1	ASCII	Perf Position (1 digit)
57.8	1883	1	ASCII	Film Gauge and Format (1: 16mm, 2: 35mm 2perf, 3: 35mm 3perf, 4: 35mm 4perf)
57.9	1884	1	ASCII	Key code detection status; see <i>Keycode Detection Status Values</i> (page 250)
57.10	1885	35	TBD	Rest of reserved area

In the ARRISCAN software, the content of the fields 45 and 48 is user definable. According to S268M-2003, field 48 should contain the value of the key number counter that is incremented every 64 perfs (20 perfs for 16 mm film). Field 45 should be the offset to the last counter increment in perfs.

However, many clients want to have the key code in feet and frames. To create a consistent pattern, we add the original values from the machine-readable barcode and the conversion into feet and frames at the end of the motion-picture information.

Television information

Field	Offset	Length	Type	Content
58	1920	4	U32	SMPTE time code
74	1972	76	TBD	Reserved for future use. ARRISCAN puts the reel name here again (as proposed by Nucoda).

A.2 The Reel Info XML File

The ARRISCAN provides a complete reel scanning mode where an entire reel is scanned automatically. For this mode a frame line detection feature is available. If frame line detection is active, the scanned image sequence is analysed for camera flashes. If a flash is detected, the position of the flash is written into the reel info XML file. After scanning, the image directory contains one image for each frame of the reel. All images are numbered in sequence.

If a lab roll has not been preselected, the operator uses the ARRISCAN's live preview image to locate the beginning and end of each take to be scanned. In this case, the scene and take information of each take is entered already by the scan operator and written into the reel info XML file. After scanning, the image directory contains chunks of sequentially numbered image sequences, where each sequence corresponds to one selected take.

The reel info XML file is created in the same directory where the image files are. It is named `<filename>#. <ext>.ReelInfo`, where `<filename>` is the name of the file without the image number, `#` is the position where the image number is placed in the file name, and `<ext>` is the file extension. For instance, if the file of the image sequence are named `img0001.dpx`, `img0002.dpx` and so on, the reel info XML file is named `img#.dpx.ReelInfo`.

The position that is written to the reel info XML file is the film transport frame position where the image sequence starts, or at which the flash was detected. In complete reel mode, this number is always equivalent to the number in the image file name.

Reel Info XML Elements

The format of the reel info XML file is simple. It consists of `<keyframe>` elements which separate the image sequence into sections. Each `<keyframe>` element contains child elements that describe the section. If the reel info XML file was created during complete reel scanning with flash detection, each `<keyframe>` element contains one `<time>` element that holds the frame position where the flash was found. If it was created during scanning of selected takes, the `<time>` element holds the position of the first frame of each image sequence, and additional elements hold information about lab roll, camera roll, scene, and take number.

values

Attributes	Type	Description
------------	------	-------------

None		
------	--	--

Childs	Number	Description
keyframe	{0,n}	Image subsequence.

keyframe

Attributes	Type	Description
------------	------	-------------

None

Childs	Number	Description
time	{1}	First frame of subsequence.
scene	{0,1}	Scene number (selected takes only).
take	{0,1}	Take number (selected takes only).
labroll	{0,1}	Name of lab roll (selected takes only).
camroll	{0,1}	Name of camera roll (selected takes only).

Examples

A reel info XML file generated during complete reel scanning with automatic flash detection looks as follows:

```
<?xml version="1.0" encoding="UTF-8" ?>
<values>
  <keyframe>
    <time>222</time>
  </keyframe>
  <keyframe>
    <time>659</time>
  </keyframe>
</values>
```

When scanning selected takes, the reel info XML file may look like this:

```
<?xml version="1.0" encoding="UTF-8" ?>
<values>
  <keyframe>
    <labroll>23</labroll>
    <camroll>A35</camroll>
    <time>103</time>
    <scene>141B</scene>
    <take>1</take>
  </keyframe>
  <keyframe>
    <labroll>23</labroll>
    <camroll>A35</camroll>
    <time>536</time>
    <scene>141B</scene>
    <take>2</take>
  </keyframe>
</values>
```

A.3 Central Job Management

When operating multiple ARRISCANs in the same facility, it is advantageous to have all scanners access the same job database so that jobs can be selected for scanning on any scanner. This section describes how central job management is set up and used.

A.3.1 Setting Up Central Job Management

The following steps are required to activate central job management:

- A server for the job database must be designated. This may be the host of any of the ARRISCANs, or it may be a separate computer. When using the latter option, the separate computer must run the same version of MySQL as the ARRISCAN hosts. Generally, it is recommended to use one of the hosts as the job server.
- All ARRISCAN hosts must be set up to access the central job server. Note that there are two databases required for each scanner: the central job database, and the local parameter database. That is, there is still one local database on each scanner which contains the calibration parameters for that machine.
- Each scanner must be registered in the 'machine' table of the central job database.

The Central Job Server

When a central job database is set up, each scanner's local job databases becomes obsolete.

- It is recommended to use an existing local database as the basis for the central job database. The scanner's local database then simply becomes the new central job database.
- Jobs from other local job databases can be migrated to the central job database by exporting them using the astools script `asjobexport.pl`, then importing them on the central host with `asjobimport.pl`. Note that the jobs must be exported *before* central job management is set up.
- It is also possible to use straight MySQL commands to move jobs between databases. It is recommended to always keep backups of databases when manipulating them directly in this way.
- It is also possible to use a separate dedicated machine as the central job server. This machine needs to run the same MySQL version as the scanner hosts. To set up the job database, export a local 'asjob' database using `mysqldump` on one of the scanner hosts, then import it on the central job host.

Local databases that are not used any more should be renamed or deleted to ensure that they are not accidentally accessed in case something goes wrong with the configuration.

Scanner Host Setup

Each scanner host needs to know about the location of its job and parameter databases. This is configured in the file `/usr/arri/etc/database.conf`. Below is an example of the contents of this file configured for local database access:

```
# This file contains the parameters for the database connections.

# The JobEditor only uses the parameters for the job database.
# It will read the parameters for the "asparams" databases from the
# "machine" table.

ME_DB_DBNAME=asparams
ME_DB_SERVERNAME=127.0.0.1
ME_DB_USERNAME=arriscan
ME_DB_PASSWORD=""

ME_DB_JOB_DBNAME=asjob
ME_DB_JOB_SERVERNAME=127.0.0.1
ME_DB_JOB_USERNAME=arriscan
ME_DB_JOB_PASSWORD=""
```

To set up central job management, the parameter `ME_DB_JOB_SERVERNAME` must be changed to the IP number of the central job server. This must be done on each scanner host that uses central job management (normally this will be all scanners in the facility).

For local databases, the loopback address 127.0.0.1 may be used as the server name.

Machine Database Table

Each machine that is connected to the central job database must be registered in the 'machine' table of the central database. The entries in the 'machine' table must be created manually when the central job management system is set up. An entry in the 'machine' table describes the location where the parameter database is found for all scanners that are connected to the central job database. It contains the following fields:

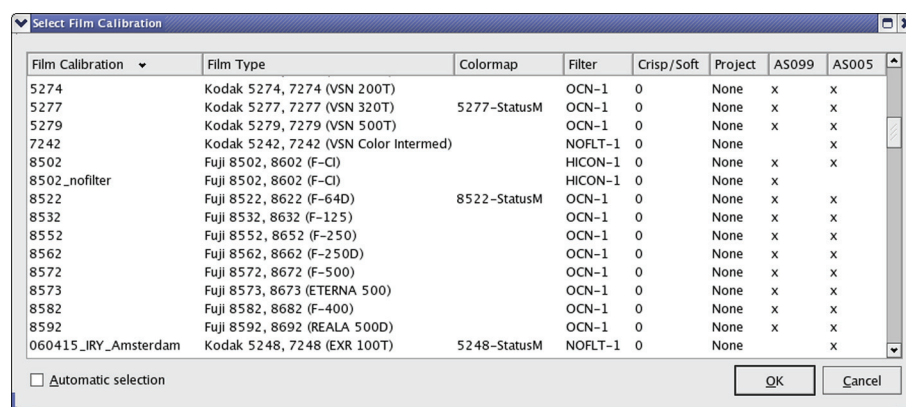
Field	Type	Description
sernr	int	Serial number of the machine.
dbname	string	Name of the parameter database on the scanner host.
hostname	string	Host name or IP number of the scanner host.
username	string	User name for logging into the parameter database on the scanner host.
password	string	Password for logging into the parameter database on the scanner host.

- There must be one entry for each scanner host that uses the central job database.
- If the host of one of the scanners is also used as the central job server, there must still be an entry for this host in the 'machine' table. This entry must have the complete IP number (or host name) of this machine. It may *not* use the loopback address 127.0.0.1.
- When using local job management, the machine table must contain a single entry for the local machine only. This entry may use the loopback address 127.0.0.1 as the hostname. However, this will prevent the ARRISCAN daemon to be accessed from external computers (such as when running the ARRISCAN GUI under Windows on the Remote PC).

A.3.2 Using Central Job Management

From the operator's perspective, the only difference between local and central job management is the handling of film calibration settings in job definitions. Everything else is the same as when using a local job database. When central job management is configured correctly, all ARRISCAN software utilities will automatically use the central job database. This includes the astools scripts as well as the ARRISCAN software installer.

Managing Film Calibrations



The film calibration of the ARRISCAN is specific to each machine, because light sources differ slightly between scanners. Therefore, film calibration settings cannot be stored in the central job database. Of course, when using the ARRISCAN's colormaps, images scanned on different scanners will match in color, but only after the Base + Lights calibration is done on each machine individually.

When a job is executed on a machine, the ARRISCAN software checks if a film calibration that has the name specified in the job has been stored on that machine. If such a calibration exists, it will be used to scan the job. Otherwise, an error will result and job processing will stop.

In order to be able to scan the same job on different machines, the job's film calibration must be available on any of these machines. It is therefore necessary to create this calibration on all machines that the job may run on.

When central job management is active, the ARRISCAN's Job Editor will assist with managing film calibrations between jobs by showing which calibrations are available on which machines in its film calibration selection dialog. This is shown in the screenshot of the Job Editor's film calibration selection dialog above. In this example, two machines named "AS099" and "AS005" are configured to use a central job database. As you can see, the two columns on the right of the selection area show which calibrations are available on each of the two machines.

When changing the parameters of a film calibration that is defined on multiple machines, these changes must be made on *all* machines where a calibration of the same name exists. Otherwise, results will differ when a job that uses this calibration is scanned on different machines. Parameters that differ between machines are displayed as '???' in the Job Editor's film calibration selection dialog.

Correcting Geometry Offsets

There is a positioning tolerance when the glass plate is placed in the gate for calibrating a scanner's geometry. This can lead to mismatches in the geometry offsets between different scanners. The **Offset x** and **y** values in the Geometry Calibration panel (in the System Calibration tab in the GUI) can be used to compensate for this. These offsets are specified in units of 3K pixels. To determine the offset correction values for multiple scanners, do the following:

- ① **Load a reference film on the first scanner.**

- ② **Create a reference geometry on the first scanner.**

Bring up an image that has a reference position which you can use for frame accurate positioning of the crop marquee. Select a 3K acquisition format. Do a preview scan and position your crop marquee so that the top left corner of the marquee sits on the reference position. Save the geometry.

- ③ **Load the reference film on the second scanner.**

- ④ **Scan the reference frame using the reference geometry.**

When the scanners are set up to use a central job database, the same geometries are available on all scanners.

- ⑤ **Check the positioning of the crop marquee.**

If the top left point of the crop marquee does not sit on the reference position on the second scanner, use the **Offset x** and **y** controls in the Geometry Calibration panel to correct the positioning. You do not need to save the settings. They are automatically written to the ARRISCAN's database.

- ⑥ **Repeat for every scanner in the facility.**

Troubleshooting

The following list contains a number of common issues that may occur with central job management.

Job processing stops with the message "Cannot find a record with name=... in table filmcalibration"	There is no film calibration of that name defined on the local machine. A calibration of this name must be created on each scanner where the job is to be scanned
I cannot see a film calibration in the film calibration selection dialog, even though I know it exists	Most likely, the film calibration was created on another scanner. When selecting a film calibration from the Film Calibration section of the Acquisition tab in the GUI, only local film calibrations are shown. Calibrations from all scanners are only displayed in the Job Editor's film calibration selection dialog. In any case, the missing calibration must be created locally before a job that uses this calibration can be processed on the scanner.
A column entry in the Job Editor's film calibration selection dialog reads '???'	A film calibration with this name exists on more than one scanner, but the parameter where the '???' appears is different on some scanners. The calibration should be modified so that this parameter is the same on all scanners to ensure consistent scanning results.
The machine columns in the film calibration selection dialog of the Job Editor do not show the correct serial numbers	Check the 'sernr' field of the table 'hwoptions' in the 'asparams' database on the affected scanners.

A.4 Key Code Detection Status Values

When exporting key code information, the ARRISCAN often exports the key code detection status along with the key code value itself. For instance, when running the on-frame script during job processing, the environment variable `ASKEYCODESTATUS` contains this status. It is also written to field 57.7 of the ARRI extensions to the DPX file header. The list below describes the meaning of the status values.

- | | |
|------------------------|---|
| 0 (detection error) | The key code could not be detected. |
| 1 (interpolated) | <p>Key code position could be calculated with 100% certainty. This means that the key code</p> <ul style="list-style-type: none">• was logged at this exact position or• is between two logged values that are in sequence and adjacent to each other or• is between two logged values that are in the correct sequence with one or more undetected key codes in between. |
| 2 (extrapolated) | <p>Key code position is before the first logged key code value or after the last logged value. Note that in the ARRISCAN the film passes the key code reader before the gate (when the film moves from left to right). Therefore when loading the roll on the left, there should never be extrapolated key code positions.</p> |
| 3 (in splice region) | <p>The key code position is between two logged values that are not in sequence. From the distance between the two logged values, the ARRISCAN has deduced that there are no undetected key codes between the two logged values. Since the ARRISCAN cannot detect the exact splice position, the splice is assumed to be half way between the two logged positions. Hence, the position will be extrapolated from the nearest logged key code value. The position is then uncertain by at most 64 perfs (but usually much less).</p> |
| 4 (position uncertain) | <p>The key code position could not be calculated with certainty because one of the following cases has occurred:</p> <ul style="list-style-type: none">• The position is in a splice region where at least one key code was not detected. This means that the uncertainty is larger than the maximum 64 perfs that are guaranteed when the status is 3 ('in splice region').• The key code position is in a splice region, but the logged values before or after this region are not in sequence. This should be extremely rare. |

A.5 Key Code Definitions

Key code definitions contain the information about the machine-readable manufacturer and film type codes as well as the human-readable two-character code and the corresponding film stock description. The ARRISCAN software stores this information in the 'keycode' table of the 'job' database. Changes in this database are picked up by `MeDaemon`, `Marvin`, and the `JobEditor` after a restart of the software. This makes it possible for users to add new materials to the list of key code definitions if required.

ARRI also does its best to keep up with newly released film types. There is a new tool that can be used to update the key code definitions in the ARRISCAN's database. The tool is called `asdbkeycode` and is part of the ARRISCAN software. It is executed automatically when new software is installed so that the key code definitions in the database are always up to date. It can also be called explicitly from the command line if required. If necessary, ARRI will make the latest version of `asdbkeycode` available so that users can update their database without needing to reinstall the ARRISCAN software. To get a description of the options available for `asdbkeycode`, simply call it from the command line without any arguments.

A.6 Licensing DICE

Infrared based defect correction as a technology is protected by Kodak. A commercial license has to be obtained in order to use DICE. Free test licenses are available for evaluation. All licensing issues are handled directly by Kodak. In order to enable the Digital ICE Technology software, an End User License Agreement must be executed before Kodak provides an encrypted License Key. The End User License Agreement and a License Key Order Form may be requested by email from Kodak's support personnel at WW-DICE@Kodak.com.

When contacting Kodak about a license, you should include the ARRISCAN's host computer ID as printed by the utility `/usr/arri/bin/start-dicelm.sh`, as this ID is required to issue any DICE license.

The DICE license is a text file with the file extension `.lic`. It must be placed in the folder `/usr/local/etc` on the ARRISCAN's host computer. Make sure no files with the extension `.lic` are found in this directory other than the most recent license file.

A.7 Defect Map Encoding

The ARRISCAN can save defect maps as bilevel and trilevel maps. A bilevel map is essentially a bitmap where the 'black' pixels are correct and 'white' pixels are defects. A trilevel map differentiates between *correctable* and *critical* defects. The encoding of the bit values for each type of defect map is documented below.

Bilevel Defect Map

Value	Defect Type
0	No defect
Any non-zero value	Critical defect

Bilevel maps may be stored as bitmaps where each pixel is stored as a single bit, or in any other bit depth.

Trilevel Defect Map

Binary Value	Defect Type
0	No defect
10... and 01...	Correctable defect
11...	Critical defect

Trilevel maps require a bit depth of at least two bits per pixel. At larger bit depths, only the two most significant bits determine the type of the defect. The values of the less significant bits are not guaranteed to have specific values (except for non defect pixels, where all bits are 0). There is currently no distinction between the bit sequences starting with 01 and 10. However, this may change in the future.

Defect maps can be saved inside the high resolution image file, or can be saved in separate 8-bit TIFF files. The encoding is the same in all cases.

Format	Map Types	Bit Resolution	Disk Usage	Compatibility
Inside High Res (alpha)	Bilevel & Trilevel	Same as high res, but only 2 bits used	Poor (30% larger than high res)	Most applications cannot deal with this type of image.

Inside High Res (Lustre DPX)	Bilevel & Trilevel	2 bit	Best (same size as high res)	Even applications that cannot read the additional defect map information can usually open this type of image.
Inside High Res (dual element DPX)	Bilevel	1 bit	Moderate (slightly larger than high res)	Most applications do not support the extra image element. This format is primarily used by PFClean.
TIFF 8-bit lin	Bilevel & Trilevel	8 bit, but only 2 bits used	Poor	Any application that can read TIFF images can open this type of file, but most applications that can deal with defect map data will also support one of the other formats.
TIFF 8-bit lin compressed	Bilevel & Trilevel	Same as TIFF 8-bit lin, but highly compressible	Moderate (file itself is small, but still uses more disk space than Lustre DPX format)	Same as TIFF 8-bit lin.

Using Defect Map Information

Bilevel maps are easy to evaluate: any non-zero pixel in the map is part of a defect that needs to be corrected. Trilevel maps are more complex: pixels marked as 'critical' need to be corrected, but 'correctable' pixels have already been corrected by DICE. However, since they are marked in the defect map, 'correctable' pixels can be corrected again by a different software if desired.

A.8 OCN-2 vs. OCN-1

In August of 2007, the OCN-2 filter set was introduced to the ARRISCAN software. It was designed to replace the previous filter set for original camera negative, which was called OCN-1. This appendix explains why the OCN-2 filter set was developed.

In the ARRISCAN, images are scanned at 3k or 6k resolution. Digital filters are used to resample the images to the output resolution: commonly used formats are 2k, 4k, or 1k for proxy images. The filters are necessary to change the sampling rate of digital images ñ they are no "sharpening filters". A resampling without filter is not possible.

The main reason for oversampling is that the digital filters can be designed to remove aliasing from the image. Aliasing occurs when the original film image contains details smaller than the image sensor in the camera can resolve. Those small structures can produce patterns that are not present in the original image. The filters are designed to remove most of those unwanted patterns while preserving the original image content.

There are many variables in the design of a filter: the most important are the cut-off frequency and how steep the filter curve falls off toward that point.

The crisp-soft setting in the ARRISCAN influences both of these variables and can be used to adapt the filter to different film stocks and personal preferences. Based on early customer feedback ARRI, handled the filter parameters differently for the red, green, and blue color layers.

Each of the layers in a camera negative has a different resolution. Normally, the green layer has the highest resolution, meaning it can capture the smallest details. The blue layer has larger grains and therefore a lower resolution. Red is the bottom layer and the light gets somewhat dispersed before it reaches this layer reducing the resolution as well.

The filters of type OCN-1 in the ARRISCAN have a lower cut-off frequency in red and blue than in green. This setup was conceived to reduce the perceived graininess in the RGB image without losing any image detail. In terms of the units on the crisp-soft slider the filter for blue is reduced by -4 and the filter for red is reduced by -2. For example, if you scan with an overall crisp-setting of 2, your individual channel values are 0 for red, 2 for green, and -2 for blue.

Further response from customers showed us that this setup is not favored by everyone. Especially VFX people criticized a lack of sharpness in the blue channel.

As a remedy, version 1.3.0 of the ARRISCAN software introduced a new filter set, called OCN-2. This filter set has a wider crisp-soft range and offers adjustable offsets for each color channel. By default this filter set has no offset between color channels. This gives the operator full control over the perceived sharpness in each color channel of the final image. The filter set OCN-1 remains in the software for backward compatibility.

A.9 Predefined LUTs

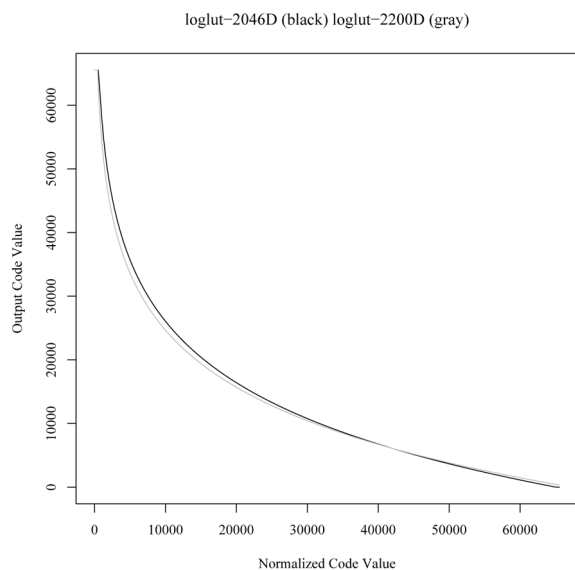
Normalized Data

If the image is stored as 'normalized', the data does not undergo any output conversion. In the ARRISCAN's processing chain, this data corresponds to the *normalized image*.

The normalized image is not inverted and does not have any gamma curve applied to it. When displayed, such images do not show correct colors without further processing.

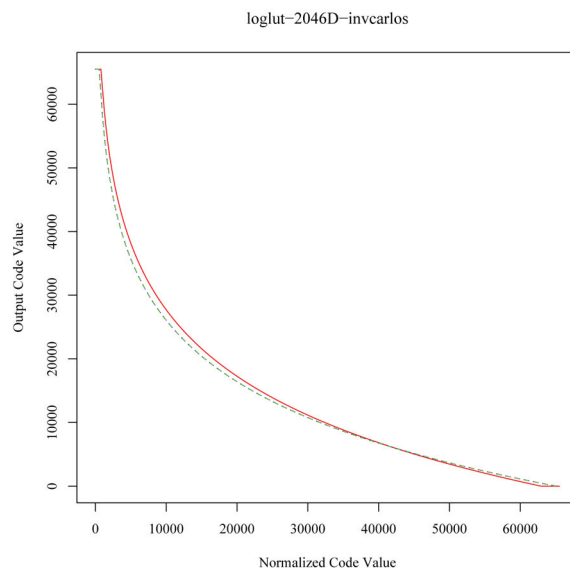
16 Bit Log

There are four LUTs for 16 bit logarithmic output. These LUTs provide the same metric as in a DPX or Cineon file but with a quantization of 16 bit instead of 10 bit.

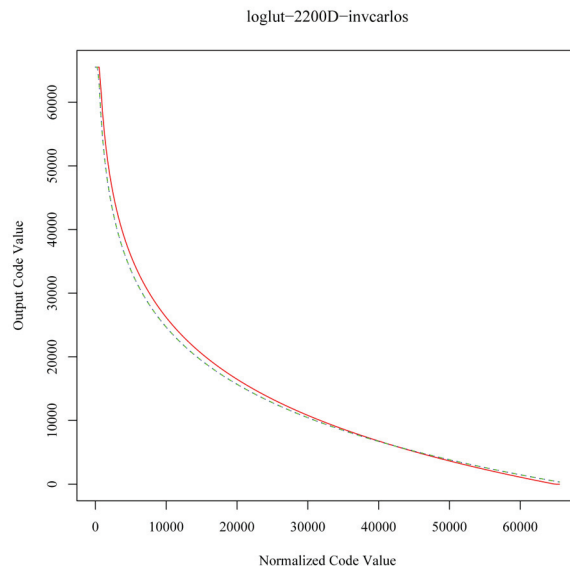


The LUT **loglut-2046D** encodes the normal density range of a Cineon file, which is 2.046 log D. The equivalent settings in a Cineon file are base=95 and gain=500.

The LUT **loglut-2200D** encodes an extended density range of 2.2 log D. The equivalent settings in a Cineon file are base=95 and gain=465.



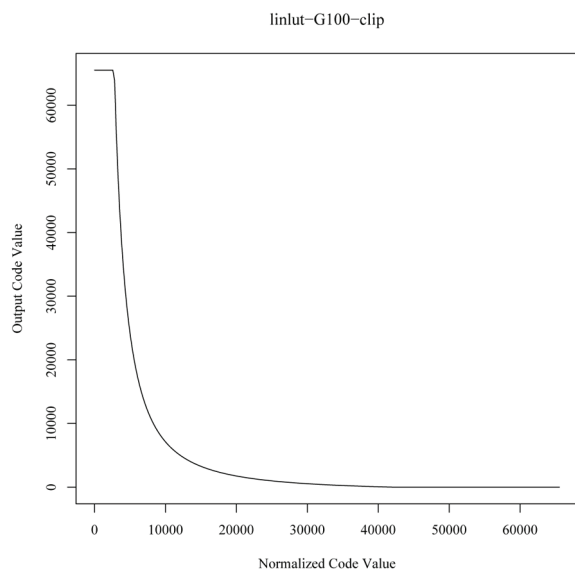
The LUT **loglut-2046D-icarlos** encodes the normal density range of a Cineon file with a higher gain in the red channel (the so called "inverse Carlos aim"). The equivalent settings in a Cineon file are base=95 and gain=(541, 500, 500).



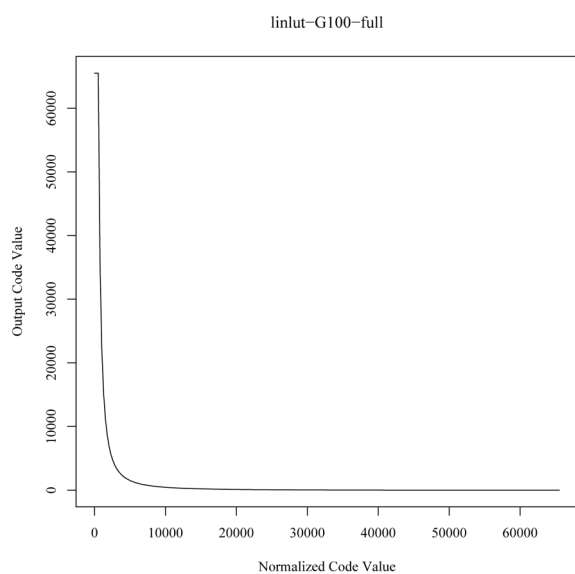
The LUT **loglut-2200D-icarlos** encodes an extended density range of 2.2 log D with a higher gain in the red channel. The equivalent settings in a Cineon file are base=95 and gain=(503, 465, 465).

Linear Output

There are two LUTs for linearized output. Both assume a negative gamma of 0.6 and a placement of the 90% white point at 1.18 log D above base (which is equivalent to a code value of 685 in a 10 bit Cineon file).



The LUT **linlut-G100-clip** converts the density range of 1.18 log D into a linear format. The 90% white point is mapped to the maximum output value (65535), higher densities are clipped. The gamma value is 1.00.



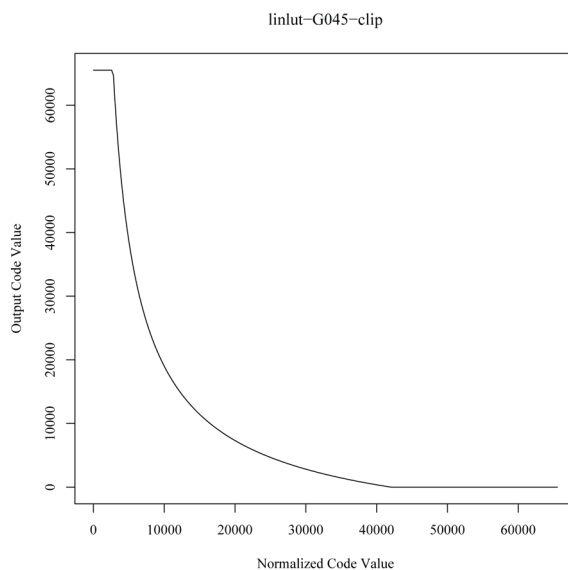
The LUT **linlut-G100-full** converts the full density range into a linear format. The 90% white point is mapped to an output value of 4095. The gamma value is 1.00.

Example of Usage

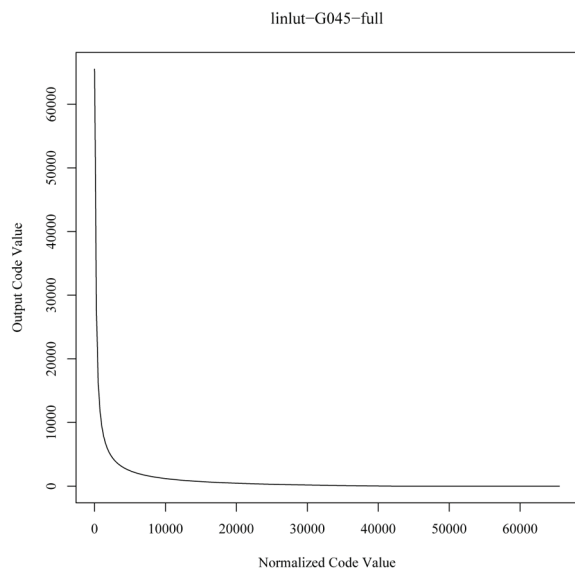
Save scans as 16 bit TIFF using the output LUT **linlut-G100-full**. Open the files in a compositing software (e.g. Shake), convert to float, and multiply by 16. This will give the same display as an image encoded with **linlut-G100-clip**. However, when you apply another color correction node, e.g. "Brightness", and darken the image, you will see that the highlights are not lost. Since the output conversion is done without correction for the monitor gamma, you probably want to apply a viewer LUT or add a "Gamma" node.

Video Output

There are two LUTs for video output. Both assume a negative gamma of 0.6 and a placement of the 90% white point at 1.18 log D above base (which is equivalent to a code value of 685 in a 10 bit Cineon file).



The LUT **linlut-G045-clip** converts the density range of 1.18 log D into a video-gamma format. The 90% white point is mapped to the maximum output value (65535), higher densities are clipped. The gamma value is 0.45.



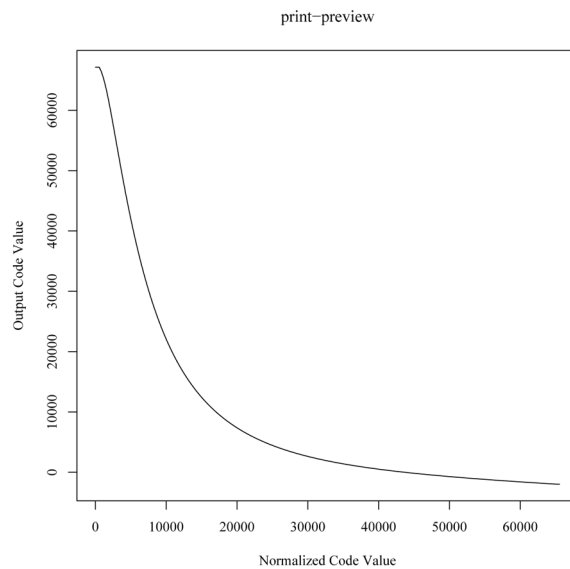
The LUT **linlut-G045-full** converts the full density range into a video-gamma format. The 90% white point is mapped to an output value of 4095. The gamma value is 0.45.

Example of Usage

Save scans as 16 bit TIFF using the output LUT **linlut-G045-full**. Open the files in a compositing software (e.g. Shake), convert to float, and multiply by 16. This will give the same display as an image encoded with **linlut-G045-clip**. However, when you apply another color correction node, e.g. "Brightness", and darken the image, you will see that the highlights are not lost.

Print Preview

This LUT can be used to generate images that look similar to a print from the negative.



The LUT print-preview emulates the tonal scale of a print film on a monitor with a typical gamma value of 2.4. It does *not* produce an accurate color rendering.

Glossary of Terms

3-Perf

A framing for 35 mm film where each frame occupies a length of 3 perforations on the film, as opposed to the 4 perforations required for traditional framings. 3-perf framing is increasingly used to save on film costs in wide-screen productions. When working with key code, the handling of 3-perf material is more complicated compared to 4-perf since the number of frames per key number differs (21 or 22 for 3-perf as opposed to 16 for 4-perf). In order to work accurately with key code and 3-perf material, it is imperative that the key code information is perf accurate. This can be achieved by storing the key code in count-perf format, or by storing additional perf information when using feet-frame format.

Aliasing

An effect that occurs when analog signals are converted into the digital domain. The conversion process cannot distinguish spatial frequencies that are multiples of the sensor's pixel frequency. See also *Oversampling* (page 26).

AOI

An Area Of Interest (AOI) denotes a part of an image that is isolated for image processing. The ARRISCAN uses rectangular AOIs for specifying the image areas for calculating the focus and for measuring the base + lights calibration. AOIs can be displayed as marquees in the viewer.

Base + Lights Calibration

The base + lights calibration adjusts the illumination so that the tint of the film base appears neutral (white) in the output image.

Cineon

The Cineon file format was devised by Kodak especially for storing digital motion picture images. It uses a 10-bit logarithmic format to preserve the film's dynamic range. See also *Logarithmic Data* (page 266).

Clipping

Clipping or overexposure occurs when a pixel receives more light than it can handle. All image detail is lost in overexposed parts of an image.

Colormap

The ARRISCAN software uses the term colormap for a matrix that is used to apply a color calibration to an image. A colormap represents a mapping between different color spaces.

Daemon

The daemon is the ARRISCAN's core software module. Its executable is called *MeDaemond*. There is exactly one instance of *MeDaemond* running on the scanner's host. In an installation with multiple ARRISCANs, there is one *MeDaemond* for each scanner. The daemon has exclusive access to the scanner's hardware and executes all scanning operations. It runs in the background (hence its name) and has no user interface.

Database

The ARRISCAN uses a relational database for storing settings, calibrations, and job information. In a relational database, information can be shared by linking items from different databases together. If an item is changed, all other items that link to it automatically reflect the change.

Digital Intermediate

A method for post processing a motion picture film where the original camera negative is scanned by a film scanner, processed digitally and finally recorded back out to film on a digital film recorder.

Direct IO

When Direct IO is activated on an ARRISCAN mount point, files are written directly to the file system during job processing, bypassing the operating system's file buffer. On some file systems such as SANs, a higher performance can be achieved by Direct IO. To ensure smooth operation, files are always buffered internally in the ARRISCAN's *Save Queue* (page 269).

Double Exposure

The standard mode of image acquisition for the ARRISCAN. For each frame, an image at normal exposure and an image at 10 times the normal exposure are combined into an output image of maximum dynamic range. See also *Single Exposure* (page 269) and *Dynamic Range* (page 24).

DPX

The DPX file format is an extension of the Cineon file format that was standardized by the SMPTE (SMPTE Standard 268M-2003). Although DPX files usually encode their data similar to the Cineon format (10-bit logarithmic, three color channels), the DPX format supports a wide range of encodings including linear data in various resolutions and multiple color channels. Due to the complexity of the DPX standard, there are sometimes incompatibilities between the implementations of different vendors. See *The ARRISCAN DPX File Header* (page 238) for a description of the information that the ARRISCAN writes into the DPX header.

Dynamic Range

A measure for the range of intensities that an imaging system can capture. See also *Dynamic Range* (page 24).

FibreChannel

A protocol for very fast transfer of data between computers and storage systems. A FibreChannel card can be installed in the ARRISCAN's host PC to interface with a hard disk array for saving scanned data.

Film Base

The transmittance of the film base determines the lowest density that can be recorded on the film. For camera negative, the unexposed clear base of the film has an orange tint that must be subtracted in the image acquisition process. See also *Base + Lights Calibration* (page 33).

Film Gate

The film gate is the hardware component that holds the film in the position where it is scanned. In the gate, the film position is fixed by the registration pin, and the film plane is established by the frame that pushes the film against the top of the gate. The gate is user-exchangeable; there are different versions for 35 mm and 16 mm film.

Final Image

The final image is the image that is written to the output file. This image has all processing applied to it, including film calibration and output LUTs. See also *The Processing Chain* (page 34).

Final Pitch

In the ARRISCAN, the final pitch is the size of the area in the film plane that corresponds to one pixel in the final image. The final pitch depends on the magnification, the oversampling ratio, and the microscanning mode. See also *Native Pitch* (page 267), *Matching Film Frame to Sensor* (page 27), *Microscanning* (page 26), and *Oversampling* (page 26).

Firewire

A protocol for transferring data between devices. In the ARRISCAN, Firewire can be used to connect external hard drives to the host PC. Some sites use such external drives to transfer scanned images between scanning and post production departments. The drives are then kept as backups.

Frame Rate

The frame rate defines the speed at which a film is to be projected. It is given in units of frames per second. The ARRISCAN software must know about the film's frame rate for calculating time code positions.

FTP

FTP, or File Transfer Protocol, is a low-overhead method for sending files over a network. In order to use FTP, an FTP client must connect to an FTP server. The ARRISCAN supports FTP for saving files during job processing. The FTP parameters are specified in the *Mount Point* (page 267) using standard URL syntax. Often faster transfer rates can be achieved using FTP compared to writing to a file system mounted over a network.

GUI

The ARRISCAN's user interface runs in a separate software module who's executable is called *Marvin*. The GUI connects to the daemon (*MeDaemond*) through a network-based protocol. Several instances of *Marvin* can be connected to the same instance of *MeDaemond* at the same time.

Host PC

The computer that runs the ARRISCAN hardware interface. Described in *The Host PC* (page 14).

Intermediate Stock

Intermediate stock is used for copies of camera negative film. These copies can be made on an optical printer or by an ARRILASER film recorder. Intermediate stock is not very light sensitive and has very low grain in order not to add to the negative's grain structure. Intermediate stock is also often used to record computer-generated test images that are almost free of grain. See also *Data From Interpositive Material* (page 138) and *Filter Type* (page 132).

Job

A job contains information about how to scan a sequence of images. The information includes the specification of the film reel, the position of the first frame to be scanned (the in-point), the number of frames to scan, the film calibration settings to use, the image size, the output to produce, and the location where the image files are to be saved. Much of this information is generated by an editing system and imported through a cut list or EDL.

Job Database

The ARRISCAN database where information that is not scanner specific is stored. This includes the job definitions. See also *The Database* (page 14).

Job Editor

A software module used to edit scan jobs. The module is accessible from within the ARRISCAN GUI (*Marvin*), or as a stand-alone module (executable *JobEditor*) on Linux or Windows. It requires access to both job and parameter databases.

Job Processing

Job processing is the term used by the ARRISCAN software for automated scanning by processing the list of active scan jobs.

Key Code

Key code is an identification tag that is printed on the film edge when the film is manufactured. It provides a perf-accurate fixed reference for specifying film positions. For more details see *introduction to key code* (page 160) in the Appendix.

Linux

An open-source variant of the UNIX operating system. Linux is a multi-user operating system that offers many sophisticated features for remote access and administration. It also has very good networking support. In the ARRISCAN, the host PC runs under Linux.

Logarithmic Data

The logarithmic representation of image data conserves storage space by storing less information in intensity ranges where the human eye is less sensitive. Since display and processing systems are usually designed to process linear data, logarithmic images must be converted in order to appear correctly. If logarithmic data is displayed on a linear scale, images appear to have very low contrast. The Cineon and DPX file formats store images in logarithmic format.

LUT

A Look-Up Table (LUT) maps a range of input values to a different range of output values. LUTs are used in image processing to apply conversion curves to individual color channels, such as gamma correction and conversion between linear and logarithmic data. LUTs affect each color channel separately.

Machine Calibration

The machine calibration is required to ensure homogeneous illumination and to prevent clipping.

Marquee

A marquee is an area denoted with a dashed frame in the viewer's display area. Marquees are used to set areas of interest (AOIs) such as the output crop or the base + lights calibration area.

Marvin

Name of the GUI executable file.

MeDaemond

Name of the daemon executable file.

Microscanning

A technique where the sensor is physically shifted to increase the resolution of the scanned image. See also *Microscanning* (page 26).

Mount Point

A Mount Point defines the location where files are saved during job processing. The mount point consists of the base path where files will be written, and parameters for accessing the file system. For each type of output file, the job definition allows you to specify further subdirectories, which are added to the mount point's base path during job processing. Files can be written directly to the file system or via FTP.

MTF

The Modulation Transfer Function, or MTF, is a measure for the amount of detail that can be reproduced by an optical system. It is defined as the ratio of the maximum input contrast to the resulting contrast in the image at a given resolution. The MTF is usually plotted as a curve of the MTF ratio vs. spatial frequency in lines/mm. A scanner's MTF curve depends on the quality of the optics and the resolution of the sensor as well as on the digital filtering applied in the image processing chain.

NAS

NAS, or Network Attached Storage, describes a file server that is accessed over a network such as Ethernet. NAS systems can be set up using standard network hardware, but high-performance networks such as InfiniBand can also be used. NAS is usually easier to set up compared to a SAN, but often does not reach the same performance levels unless expensive hardware is used.

Native Pitch

In the ARRISCAN, the native pitch is the size of the area in the film plane that is imaged by one sensor pixel. The native pitch depends only on the magnification setting. See also *Matching Film Frame to Sensor* (page 27) and *Final Pitch* (page 265).

Normalized Image

The ARRISCAN uses the term "normalized image" for calibrated raw image data that represents the transmittance of the film on a linear scale. Normalized image data from the ARRISCAN does not appear correctly on standard display hardware because it does not have any gamma correction applied to it. It is also inverted if the data originated on camera negative. See also *The Processing* (page 34)Chain.

Out of Rack

The film is 'out of rack' if part of the frame is outside of the gate area, so that some of the previous or next frame is visible. After loading the film, the frame position must be adjusted by stepping the film transport in single perforation increments so that the film is 'in rack'.

Oversampling

A technique where aliasing is reduced by acquiring more pixels than required for the final image. See also *Oversampling* (page 26).

Parallel Writing

If parallel writing is enabled on a mount point, concurrent threads are used to write files to the file system during job processing. On some file systems (notably Samba-based file systems such as CIFS) a higher performance can be achieved by parallel writing.

Parameter Database

The ARRISCAN database where scanner specific settings are stored. These include calibration parameters and machine configuration data. Described in *The Database* (page 14).

Pitch

The distance between two pixels. Usually, pitch denotes the distance between sensor pixels. See also *Matching Film Frame to Sensor* (page 27) and *Creating Custom Pitches*.

PMAC

PMAC is the name of the dedicated motion control computer that runs the film transport hardware of the ARRISCAN.

Printing Densities

A printing density measurement simulates the response of print film in the optical printing process, where a color negative is illuminated by the lights of a printing machine. The spectral response curves for printing density measurements are defined in SMPTE standard RP 180. See also *Film Calibration* (page 33).

Proxy

A smaller image generated from a high resolution image. Proxies can be processed very efficiently and are often used to preview image processing steps (for instance in color grading) before changes are applied to the high resolution images, which often requires lengthy rendering cycles.

PTR

Abbreviation for Particle Transfer Roller, which is a roller made from a special sticky rubber material that takes up dust from film. The ARRISCAN has a pair of PTRs that can be moved into the film path. See also *Scanner Components* (page 10).

Reel Settings

Reel settings are used in the ARRISCAN to define data acquisition settings for processing jobs in Complete Reel Mode, as well as for creating jobs from the Job Setup Panel of the Dailies tab. A reel setting is stored as a normal job in the database, but is not visible in the Job Editor. Reel settings are project specific. See *Complete Reel Processing* (page 119) and *Job Setup Panel* (page 152) for information on working with reel settings.

Remote PC

A separate PC that is part of every ARRISCAN installation. It is used to access the scanner's user interface by means of the host PC. Described in *The Operator Remote PC* (page 15).

SAN

A SAN, or Storage Attached Network, is a file server that appears like a local disc drive on the client. The client usually connects to the storage system over a fibre channel link. The clients are coordinated by a metadata server that controls where files are physically written onto the storage system. Each client connects to the metadata server over an Ethernet network. A SAN allows very fast throughput, but requires costly hardware on client and server.

Save Queue

The Save Queue is a memory area where finished frames are buffered before they are written to disk during job processing. This buffer is used to compensate for throughput variations during writing. For instance, if there is temporarily a high load on the storage system because another client is accessing it, the save queue holds processed frames until the storage system can be accessed again, while the scanner continues to run without interruption.

Script

A script is a text file that contains instructions for the operating system to execute specific commands automatically. Scripts are used to execute operating system tasks such as starting programs and copying files. There are also programming languages such as Perl that can be used to write more sophisticated scripts. Scripting is supported by the ARRISCAN software, and a number of Perl scripts for handling scan jobs are part of the ARRISCAN software.

Single Exposure

Mode of image acquisition where only a single exposure is made of each frame. This results in slightly more image noise compared to the standard *Double Exposure* (page 264). See also *Dynamic Range* (page 24).

Status M

A standard reference for measuring and representing film densities. The Status M standard defines spectral characteristics of a densitometer for measuring color negative film. See also *Film Calibration* (page 33).

Time Code

Time code is used in video for identifying each frame on a video tape. The time code is expressed in hours, minutes, seconds, and frames, which is normally formatted as HH:MM:SS:FF. 00:10:12:15, for example, is 10 minutes, 12 seconds, and 15 frames.

PAL video has 25 frames per second (fps): after 00:00:00:24 follows 00:00:01:00.

NTSC video has 30 frames per second (actually 29.97), after 00:00:00:29 follows 00:00:01:00. Since the speed is not exactly 30 frames per seconds there is a discrepancy between the time code and the actual program time. This is removed by introducing the drop-frame-count, which is a headache. You can learn more about this in books such as Poynton's *Digital Video And HDTV* (Morgan Kaufmann Publishers).

The ARRISCAN supports 24 and 25 fps only. Editing software can always save an EDL at one of these base frame rates, even if the video used for editing used a drop-frame format.

Touch Screen

The ARRISCAN has a touch screen on its front panel from which it can be controlled by the operator. The touch screen runs the ARRISCAN's full-featured GUI (Marvin).

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